15. APPENDICES

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14. NOTES

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13. GLOSSARY

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RAM	-	Random Access Memory
RDBMS	-	Relational Data Base Management System
RID	-	Review Item Discrepancy
RISC	-	Reduced Instruction Set Computer
ROM	-	Read Only Memory
RTF	-	Rich Text Format
RTM	-	Requirements Traceability Management
SA	-	System Architect
SCM	-	Software Configuration Management
SCSI	-	Small Computer System Interface
SDP	-	Software Development Plan
SEI		Sun Executive Interface
SGML	-	Standard Graphics Markup Language
SMAP	-	Software Management and Assurance Program
SOW	-	Statement Of Work
SSEC	-	Space Science and Engineering Center
SSIM	-	Spacecraft Simulation
STD	-	Standard
TAR	-	Technical Analysis Report
TBD	-	To Be Determined
TCP/IP	-	Transmission Control Protocol/ Internet Protocol
TMDB	-	Test Management Data Base
TRMM	-	Tropical Rainfall Measuring Mission
UAF	-	University of Alaska
UTP	-	Unshielded Twisted Pair
V&V	-	Verification and Validation
VBX	-	Visual Basic Extension
WAN	-	Wide Area Network
WBS	-	Work Breakdown Structure
WVU	-	West Virginia University
WWW	-	World Wide Web

IADB	-	Interface Analysis Data Base
ICD	-	Interface Control Documents
IDHS		Issue/Discrepancy Handling System
IIR	-	Integrated Information Repository
ISE	-	Integrated Support Environment
IRVVP		- Independent Release Verification and Validation Plan
ISVVP	-	Independent System Verification and Validation Plan
IV&V	-	Independent Verification and Validation
IVVMP	-	Independent Verification and Validation Management Plan
IRD	-	Interface Requirement Document
IRIS	-	Incorporated Research Institutions for Seismology
ISVVP	-	Independent System Verification and Validation Plan
ISE	-	Integrated Support Environment
JPL	-	Jet Propulsion Lab
Kbps	-	Kilobits per second
LAN	-	Local Area Network
LaRC	-	Langley Research Center
MB	-	MegaByte
Mbps	-	Megabits per second
MHZ	-	MegaHertz
MIS	-	Management Information System
MITI	-	Ministry of International Trade and Industry
MOU	-	Memorandum Of Understanding
mm	-	millimeter
MSFC	-	Marshall Space Flight Center
NASDA	-	National Space Development Agency (Japan)
NASA	-	National Aeronautics And Space Administration
NVRAM	-	Non Volatile Random Access Memory
NMC	-	National Meteorological Center
NOAA	-	National Oceanographic and Atmospheric Administration
NMC	-	National Meteorological Center
NSF	-	National Science Foundation
NSIDC		- National Snow and Ice Data Center
OLE	-	Object Linking and Embedding
PAR	-	Performance Assurance Requirements
PC	-	Personal Computer
PCMCIA	-	Personal Computer Memory Card Interface Association
PDF	-	Portable Data Format
PEI		PC Executive Interface
PERT	-	Program Evaluation Review Technique
PFR	-	Problem Failure Reports
ppm	-	pages per minute
Proc	-	Procedure
PSCN	-	Program Support Communication Network
PVCS	-	Polytron Version Control System

12. ABBREVIATIONS AND ACRONYMS

Below are a list of the abbreviations and acronyms used in this document.

API	-	Application Programming Interface
ARDB	-	Automated Requirements Database
BONeS	-	Block Oriented Network Simulator
CARA	-	Criticality Analysis and Risk Analysis
CASE	-	Computer Aided Software Engineering
CD	-	Compact Disk
Cert	-	Certification
CM	-	Configuration Management
COTR	-	Contracting Officers Technical Representative
COTS	-	Commercial Off-The-Shelf
DAAC	-	Distributed Active Archive Center
DBI		Data Browser Interface
DDE	-	Dynamic Data Exchange
DDTs	-	Distributed Defect Tracking system
DID	-	Data Item Description
DM	-	Data Management
Doc	-	Document
DOS	-	Disk Operating System
dpi	-	dots per inch
DR	-	Discrepancy Report
Ecom	-	EOS Communication System
ECS	-	EOSDIS Core System
EDHS	-	Electronic Data Handling System
EDOS	-	EOS Data and Operations System
EICP	-	EOSDIS Integration and Certification Plan
EOS	-	Earth Observing System
EOSDIS	-	Earth Observing System Data Information System
ESA	-	European Space Agency
ESDIS	-	Earth Science Data Information System
FTP	-	File Transfer Protocol
GB	-	GigaByte
GFE	-	Government Furnished Equipment
GOTS	-	Government Off The Shelf
GS	-	Ground System
GSFC	-	Goddard Space Flight Center
GUI	-	Graphic User Interface
HAIS	-	Hughes Automated Information Systems
HD	-	Hard Drive
HDS	-	Human Designed Systems
HTML	-	HyperText Markup Language
HTTP	-	HyperText Transfer Protocol

11. DELIVERY AND OPERATIONAL TRANSITION PLAN

As previously mentioned, the ISE is being developed within the deployment environment. This coupled with a development approach that embraces incremental deliveries which are used by the end user, minimizes the effort associated with delivery and operation establishment. When tool releases are made, the ISE system administrator will copy released software to a designated working area where write access privileges are limited. Prior to any given release, the Tool Lead and developer will be responsible for training the targeted user community in the operation and use of the tool. When problems, issues, or discrepancies are identified by either ISE developers or end users, an entry is logged into the IDHS for monitoring and tracking the item to closure.

Additional delivery and operational transition planning information will be detailed in the ISE User's Guide for each ISE tool being developed.

3. If the proposed solution is acceptable. then adopt it as the solution to be implemented.

4. If the proposed solution is not acceptable, then direct the resolver to determine other solutions.

Ensure that an appropriate required resolution date is set by the Tool Lead.

3. Update the unit to resolve the problem.

4. Rerun tests.

D. Once the SPR assignee(s) completes work on the SPR, the SPR is placed in the **"resolved"** area of the SDF.

E. The Tool Lead validates and approves the solution. The SPR is then forwarded to the ISE Development Lead/QA Engineer by placing the SPR in the **"submitted_to_qa"** area of the SDF.

F. The ISE Development Lead/QA Engineer validates the solution.

1. If the solution is not acceptable to QA, the SPR is returned to the Tool Lead by being placed in the **"rejected_by_qa"** area of the SDF.

2. The Tool Lead then identifies additional work instructions which satisfy the QA comments and re-opens the SPR by placing it in the **"open"** area of the SDF.

3. If the solution is acceptable to QA, the SPR is formally closed by placing it in the **"closed"** area of the SDF.

G. The Tool Lead enters the updated item into the developmental configuration.

H. The Tool Lead prints a paper copy of the SPR.

I. The CCB signs the SPR and the paper copy is placed into the hard copy SPR section of the SDF binder.

10.4.3. Review Boards

10.4.3.1. Configuration Control Board Procedures

The Configuration Control Board (CCB) shall minimally consist of the Tool Lead, the ISE Development Lead (Quality Assurance Engineer), and the Task 4 Lead. The CCB will process SPRs as follows:

1. Review the problem description to determine if a problem requiring corrective action exists.

2. If a problem exists, then review the proposed solution to determine if it is an appropriate response to the problem.

- submitted
- open
- resolved
- submitted_to_qa
- rejected_by_qa
- closed

These states appear in bold print within the following SPR processing procedures:

1. The originator creates the SPR and places it in the **"submitted"** area of the SDF.

2. The Tool Lead reviews the report for format and works with the originator to make it acceptable. The Tool Lead assigns an SPR log number using the next number available and maintains the SPR in the designated area within the SDF.

3. The CCB convenes to review all newly submitted SPRs. If necessary, the Tool Lead performs a detailed technical analysis of the SPR to determine the validity and scope of the problem.

4. If the change is deemed as invalid by the CCB, the SPR is forwarded to the ISE Development Lead/QA Engineer for closure and is also returned to the originator with a closure explanation.

5. If the SPR is approved by the CCB then:

   A. The Tool Lead adds the SPR to the list of all open SPRs by placing it in the **"open"** area of the SDF.

   B. If the SPR represents a problem within the contract scope then:

      1. The Tool Lead documents the expected steps to be taken to solve the problem including the identification of the controlled items which will be effected. The Tool Lead then assigns a resolver and a resolution date.

      2. The Tool Lead provides the engineer assignee(s) with a copy of the SPR.

   C. Once the SPR assignee(s) receives the SPR, the assignee(s) initiates the resolution process, performs the corrective action, and re-tests appropriately.

      1. Check affected unit out of the working software version.

      2. Verify that no unauthorized changes have been made to the unit.

4. Submitted By	Filled in by the submitter. Contains the Name, Company, Organization and phone number of the submitter as well as the date the SPR was submitted.
5. Resolution By	Filled in by the Tool Lead. Contains the Name, Company, Organization and phone number of the resolver(s), the scheduled date the SPR is to be resolved by, and the actual date that the SPR was resolved on.
6. Approved By	Filled in by the Tool Lead. Contains the Name, Company, Organization and phone number of the approver as well as the date the SPR was approved on.
7. Closed By QA	Filled in by the ISE Development Lead/QA engineer. Contains the Name, Company, Organization and phone number of the ISE Development Lead/QA engineer closing the SPR as well as the closing date.
8. Problem Description	Filled in by the submitter. Contains a description of the problem.
9. Units/Documents Affected	Filled in by the submitter. Contains a list of the elements affected by the problem.
10. Recommended Solution	Filled in by the submitter indicating the proposed solution.
11. Actual Solution	Filled in by the resolver(s). Contains the steps the resolver took to solve the problem.
12. Category of Problem	Filled in by the Tool Lead.
13. Phase in which the problem	Filled in by the Tool Lead. should have been found

10.4.2.1.1. SPR Processing Procedures

The following states exist for SPRs:

10.4.2. Configuration Control Forms

10.4.2.1. Software Problem Report

Exhibit 10.4.2.1-1, Software Problem Report Form, shows the form for a Software Problem Report (SPR). Errors, problems, or issues submitted against items within the developmental configuration will be attached to SPRs for internal tracking. A log of the mapping between submitted errors, problems, issues, or action items and SPRs will be maintained in the SPR area of the SDF.

Software Problem Report

SPR #: AAAbb99999				
Title:				
Source:				
	NAME	PROJECT	PHONE	DATE
Submitted By:				
Resolved By:				
Approved By:				
Review Block:	NAME	PROJECT	PHONE	DATE
Closed By:				
Problem Description:				
Software/Documentation Affected:				
Recommended Solution:				
Actual Solution:				

Problem Category:
Requirement Clarification _____ Interface Error _____ Error Logic _____
Requirement Change _____ Standards Error _____ Other _____

SPR 1/23/95

Exhibit 10.4.2.1-1 Software Problem Report Form

The following paragraphs discuss the content of the fields on the above form:

1. SPR # — Assigned by the Tool Lead upon determination that the SPR is valid
2. Title — Filled in by the submitter. A short description of the contents of the SPR
3. Source — Filled in by the submitter. The identification of the configuration item in which the problem was discovered.

10.4.1. Configuration Control Flow Chart

Exhibit 10.4.1-1, Configuration Control Flow, shows the flow of activity when a change proposal or software problem report is filed against a configured item.

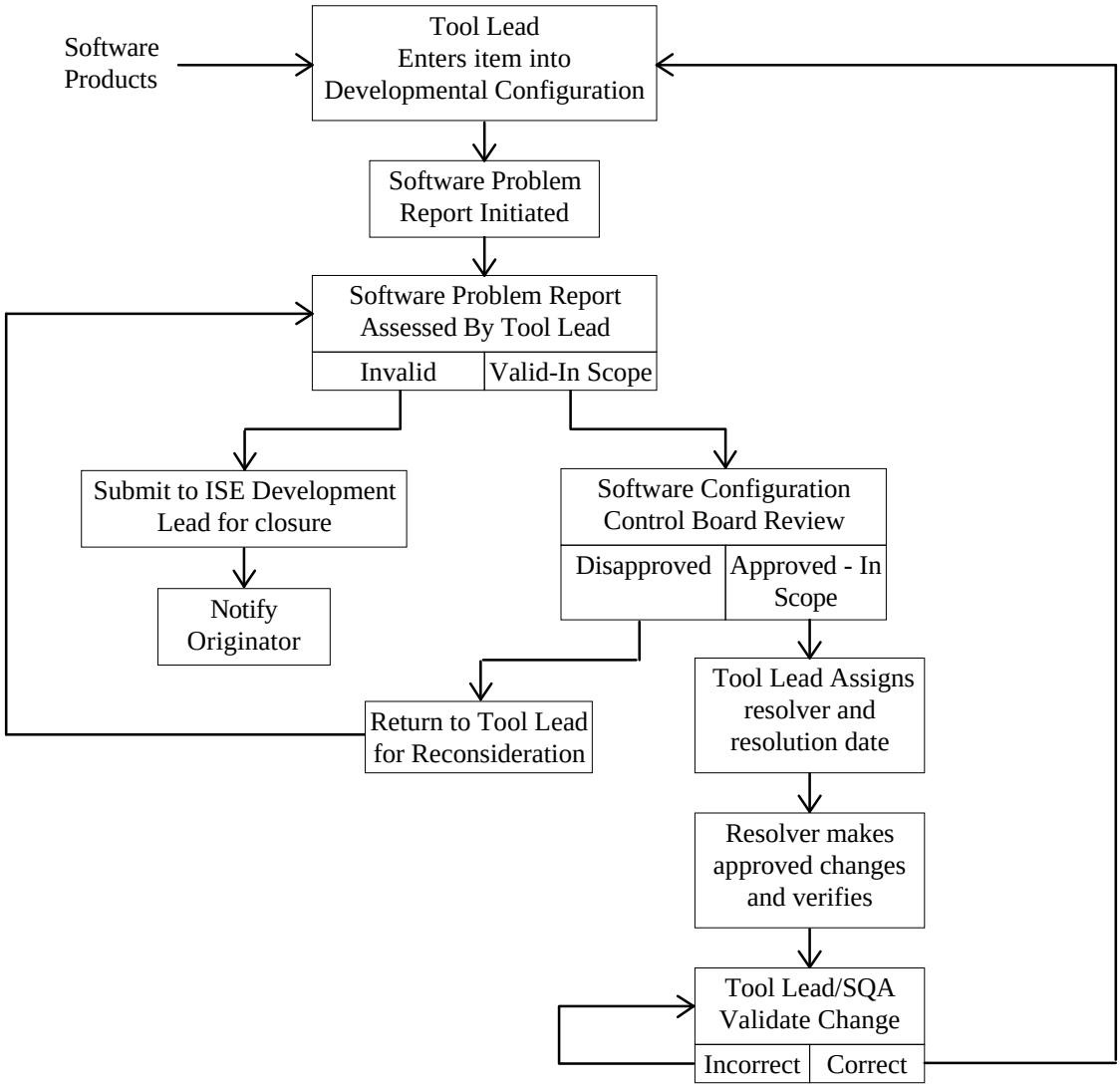

Exhibit 10.4.1-1 Configuration Control Flow

For each deliverable release of software, a PVCS version will be archived for configuration monitoring associated with the release. For deliverable documents, an entry will be maintained in the Lotus Notes Data Management library as well as an archived PVCS version.

10. CONFIGURATION MANAGEMENT PLAN

10.1. Configuration Management (CM) Approach

The information included within the following subsections establishes the requirement for configuration identification, configuration control, status monitoring and the use of reviews and audits in support of the configuration management process. The procedures describe the approaches and methods utilized to manage developmental configurations, to establish software and document baselines, and to identify and control software changes.

10.2. CM Organization Structure

Each Tool Lead has primary responsibility for CM for the tool development project. Other personnel which play an active role in the CM process includes the Task 4 Lead, and the ISE Development Lead. These individuals comprise the Configuration Control Board (CCB) for the ISE development effort. Refer to section 4.3.3, Organization, for a graphical representation of how the above mentioned personnel fit into the overall ISE development organization.

The software configuration management organization and the software quality assurance organizations are tightly coupled. The relationship between these two organizations is centered around the review of project data prior to being placed under configuration. Once a project data item has been placed under configuration, the Tool Lead and Quality Assurance Engineer (ISE Development Lead) play major roles in the change process.

10.3. CM Resources

Two primary CM tools will be used to maintain the developmental configuration during ISE development activities. The first consists of an electronic Software Development Folder (SDF) for each development item. Each development item SDF conforms to a predetermined hierarchical directory structure on the PC File server. The second CM tool is the PVCS COTS tool from Intersolv. PVCS allows for file based CM on either PC or Sun Solaris files. The PVCS tool supports file check-in/check-out and baselining for releases.

10.4. Configuration Control

Software or documentation which has been entered into the developmental configuration at any level will be under configuration control. Changes to software or documentation may be initiated as a result of software problems, documentation errors, or changes in requirements. Change procedures documented in this section ensure changes are coordinated, reviewed, evaluated, authorized, and implemented correctly. The primary mechanism used in tracking changes is the Software Problem Report (SPR).

CRITICALITY AND RISK ANALYSIS REPORT				
System	Criticality	Risk	CA RA	Recommended Action
ARDB	1	2.3	2.3	
IADB	1	2.3	2.3	
TMDB	1	2.7	2.7	
Mosaic Browser	1	2	2	
Sun - Exec	1	2.3	2.3	
PC - Exec	1	2.3	2.3	
Overall ISE	1	2.3	2.3	

Exhibit 9.1-5 Sample CARA Report

Each criterion is evaluated against each of the development systems and problems are identified. A recommendation to mitigate the problem is also presented on this report. The Criticality And Risk Analysis (CARA) score is the criticality score multiplied by the risk score. CARA scores could change on a frequent basis as measures are taken to mitigate risks. A Risk Assessment Report is a snapshot in time of the unknowns and an estimate of their possible occurrence at that point. A CARA report is developed every other month to reevaluate the risks to the project and to identify the highest risk areas. A sample CARA report for the six development systems is shown in Exhibit 9.1-5.

The CARA score indicates the degree of risk on the same terms across all systems. This helps in prioritizing activities and identifies areas of highest need. CARA scores of 4 or above are considered “At Risk” and should have some action taken to mitigate the risk. Anything below 4 is considered non-critical.

for ISE		
Problem	Criticality	Recommended Mitigation
Budget	0	
No budget impacts		None required
Schedule	2	
Limited detailed element level requirements		Develop the detailed element requirements during the planned software analysis period.
Performance	1	
Performance requirements not defined		Develop performance requirements during the planned software analysis period

Exhibit 9.1-3. Sample Criticality Report

RISK REPORT for ISE		
Problem	Risk	Recommended Mitigation
Complexity	1	
Not complex		None Required
Maturity of Technology	3	
Limited Windows Development Experience		Use a powerful GUI builder product (SQLWindows)
Lack of Client/Server Development Experience		Implement the planned training schedule for client/server development (SQLWindows)
Requirements Definition & Stability	2	
Expansion of requirements are likely during the prototyping phases		Prioritize requirements based upon needs and impacts. Implement the CCB procedure defined in Section 10. Use COTS products to meet new needs.
Testability	1	
Acceptability of test results easily determined		None Required

Exhibit 9.1-4 Sample Risk Report

	RISK EVALUATION CATEGORIES AND CRITERIA		
Category	High 3	Moderate 2	Low 1
Requirements Definition & Stability	baseline not established • Many organizations required to define requirements • Much integration required • High degree of interaction with components external to core system	some changes • Some integration required • Little interaction with external components	little potential for change • Little to no integration required • No interaction with external components
Testability	• Difficult to test • Requires much data analysis to determine acceptability of results • Many operational environment and input variations	• Requires some test data analysis to determine acceptability of results • Moderate amount of operational environment and input variations	• Acceptability of test results easily determined • Few operational environment and input variations

Exhibit 9.1-2 Risk Evaluation Categories and Criteria Scoring

CRITICALITY REPORT

	RISK EVALUATION CATEGORIES AND CRITERIA		
Category	High 3	Moderate 2	Low 1
Complexity	• Highly complex control/logic operations • Unique devices/complex interfaces • Many interrelated components	• Moderately complex control/logic operations • May be device dependent • Moderately complex interfaces • Several interrelated components • Function has different behavior in different modes or stages	• Simple control/logic operations • Not device dependent • Function applies to a single mode or stage
Maturity of Technology	• New/unproven algorithms, languages & support environments • High probability for redesign • Little or no experience base in this application	• Proven on other systems with different application • Moderate experience base	• Proven on other systems with same application • Mature experience
	• Rapidly changing	• Potential for	• Solid requirements -

	CRITICALITY EVALUATION CATEGORIES AND CRITERIA			
Category	Catastrophic 4	Serious 3	Moderate 2	Low 1
Budget 2	Projected cost is more than double original budget 6	Projected cost is more than 50 percent over original budget 5	Projected cost is more than 20 percent over original budget 4	Projected cost is over original budget by less than 20 percent 3
Schedule 1	Projected schedule is more than double original schedule 5	Projected schedule is more than 50 percent over original schedule 4	Projected schedule is more than 20 percent over original schedule 3	Projected schedule is over original schedule by less than 20 percent 2
Performance 0	- Failure could result in complete and permanent loss of operational capability - Represents a permanent impediment to expansion 4	- Failure results in an irretrievable loss of data - Has potential for serious latent defects - Could make expansion difficult 3	- Failure necessitates regeneration of data or products - Failure impacts system or data integrity - Is detrimental to expansion - Suboptimal solution 2	- Failure results in time delay in providing service - Technical solution is less than optimal but is without serious life cycle cost consequences 1

Exhibit 9.1-1 Criticality Evaluation Categories and Criteria Scoring

9. RISK MANAGEMENT PLAN

9.1. Risk Assessment and Evaluation Process

Risk is usually addressed in conjunction with criticality. Criticality is the measure of the impact of a particular problem while risk is the likelihood of occurrence of the problem. These two factors are combined in a Criticality And Risk Assessment (CARA) report. Since the ISE system is a support system for IV&V functions, the system is not mission critical and provides no life sustaining or life threatening functions. Therefore, all related risks must be considered non critical. Risk on the ISE development refers to the possibility that the system will:

- Not meet budget requirements,
- Not meet schedule requirements, or
- Not meet performance requirements.

In reference to a particular function, these three criteria are sometimes mutually exclusive. Therefore, a quantitative rating system is provided. The highest risk is the possibility that the system will not meet budget requirements. The budget is highest because it is the hardest to change and will have the highest visibility if not met. Second highest is schedule requirements. The schedule can be modified with no cost extensions if it is apparent that the schedule will not be met. However, the schedule is not infinitely modifiable, since usefulness of the system is dependent on timeliness of its availability. The schedule is dependent on the schedule of IV&V activities of the EOSDIS system. Performance requirements are third, since performance is the most easily modifiable criteria. Features and capabilities can be removed from the plan to meet budget and schedule while additional features and capabilities may be added as schedule and budget permit. Poor performance, however, could render the entire system useless. Included in performance are technical objectives. For example, the portability and expandability of the system are measures of performance.

The mitigation of risk is not a straight forward problem, since solving a schedule problem may require an additional cost, thereby affecting the budget. Likewise, improvements in performance can affect both the schedule and the budget. The goal is to provide the best possible performance while coming as close as possible to the initial schedule and budget. Exhibit 9.1-1 shows the scoring criteria for the criticality according to the category. To determine the Criticality score, the problem is evaluated against each of the three categories. The categories are weighted. The category score is added to the level of criticality and these three scores are then averaged together for the Criticality Score.

Exhibit 9.1-2 shows the scoring criteria for the risk according to the category. Each category of risk has equal weight. The score is evaluated in a similar manner as the criticality score, by averaging the risk from each category.

8. ASSURANCE PLAN

In building the ISE, six applications will be developed in support of EOSDIS IV&V activities. Engineering staffing plans and schedules associated with the six development items reflects that no more than two engineers will be working a single development item. Based upon the staffing plans and the extensive use of prototypes to elicit application compliance feedback, limited resources will be applied to performing both product and process assurance. Other than the Tool Lead, the only other resource performing an assurance function internal to the ISE development organization is the ISE Development Lead. The ISE Development Lead has been designated as the Quality Assurance (QA) Engineer and will primarily focus attention on product deliverables. Due to the size and nature of ISE development activities, no separate assurance plan will be generated.

7. SUSTAINING ENGINEERING AND OPERATIONS ACTIVITIES PLAN

The EOSDIS IV&V Infrastructure and Tool Development task order (Task 4) reflects an end date of 14 June 1996. This date corresponds to the date that the first fully functional release of the ISE is to be fielded. Suntaining engineering and operation activities for the ISE beyond 14 June 1996 are TBD.

6.4. Interface Control Plan

The identification of the internal interfaces is handled in the analysis phase. The ISE has at least one external interface besides the User Interfaces. This interface is to the Hughes Requirements & Traceability Management System. The internal interfaces are managed by the Configuration Control Board in compliance with the Configuration Management procedures detailed in section 10. The external interfaces are managed by the CCB with the addition of a representative of the developer of the other system or the user community if it is an User Interface.

6.5. Training for Development Personnel Planning

Since the development teams are small, the teams must be highly efficient. There is no room for specialization on the one or two person teams. Therefore, all Tool Leads and development software engineers receive training in the development tools and environments they are using within schedule and budget constraints. The training schedule includes training in Lotus Notes development, client/server applications using SQLWindows, and C++ development.

6.1.5. Feasibility and Risks

Prototyping is performed within the deployment environment. This helps mitigate the risk of full scale environment related problems at final release. The prototype system is used by the actual users performing valid tasks with current data. This mitigates the risk of problems that are allowed by idealistic test cases and fabricated data sets. Further discussion of feasibility and risk can be found in Section 9 of this document.

6.2. Products and Reports

All development phases produce documentation and software that in general follows a tailored version of the NASA Software Documentation Standards from the NASA Software Engineering Program NASA-STD-2100-91. The individual Data Item Descriptions (DIDs) used are:

	DID	CDRL	Description
•	NASA-DID-P200	0408	ISE Element Requirements
•	NASA-DID-P300	0409	ISE Software Design
•	NASA-DID-P400	0409	ISE Software Design
•	NASA-DID-P500	0413	ISE Element Version Description
•	NASA-DID-P600	0411	ISE Element User's Guide

6.3. Formal Reviews

An internal review of the system and its functions is performed at each phase. These internal reviews include the development team and the task leads. A review of any issues or discrepancies submitted by the user community are performed at that time. The following reviews are conducted:

- Software Requirements Review (Internal)
- System Design Review (Formal)
- Implementation Readiness Review (Internal)
- Test Readiness Review (Internal)
- ISE Release 1 Demonstration - (Formal)
- ISE Release 2 Demonstration - (Formal)

All formal reviews are contractual obligations. Formal reviews include the Program Manager and the NASA Contracting Officer's Technical Representative (COTR). The formal reviews are shown in Exhibit 4.3.1-1, ISE Development Schedule.

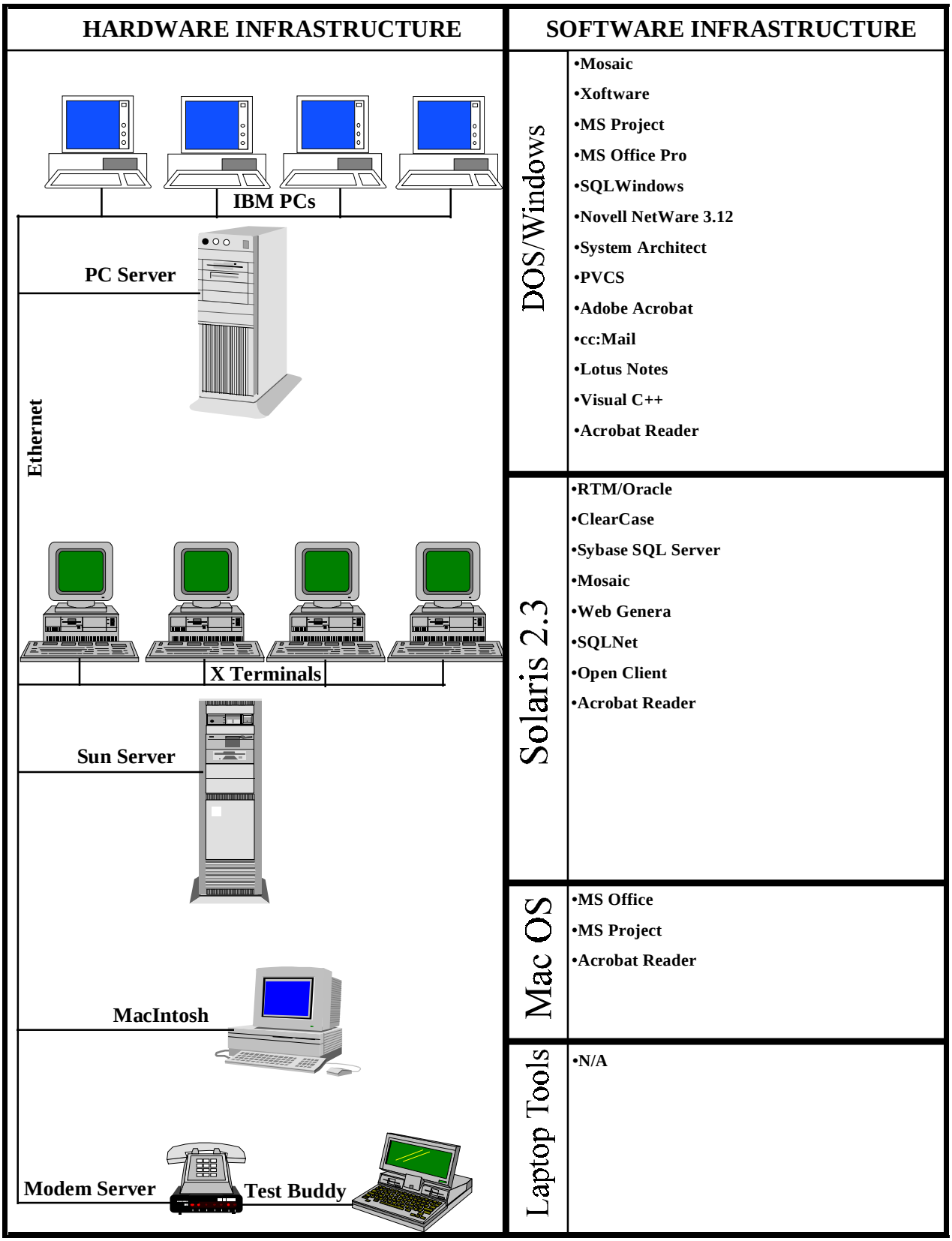

Exhibit 6.1.4-1 Engineering Development Environment

per the CCB, as well as the new features slated for that release. Further discussion of the configuration control can be found in Section 10 of this document.

6.1.4. Engineering and Integration Support Environment

The engineering development environment is illustrated in Exhibit 6.1.4-1. The development is being performed on the same hardware system as the deployment system. Since there are incremental prototype releases made throughout the development cycle, partitioning of the server is required with a duplicate development directory structure. To avoid accidental corruption of the prototypes or the deployed system, only the System Administrator has authority to copy executables to the working directories. The entire development team has read only authority on the working directories. This way the developers can copy existing data for testing purposes from the actual data sets, perform all functions as if it is installed on the deployed system, and record the results.

different according to the complexity and size of the system component as well as the resources applied to the development activities.

6.1.1.3. Implementation

Implementation of the system is incremental and actually begins in the analysis phase through prototyping. Each prototype release extends the features of the previous release. The final delivery is scheduled to be a full implementation of the features defined during the analysis and design phases. Functional testing is performed on each incremental release.

6.1.1.4. Test

Testing is performed throughout the system development process including the testing of features exhibited in prototype releases. This testing coincides to functional testing and is performed by the developers and the user community (e.g. IV&V analyst). Since the users actually employ the incremental releases into their processes, it can be noted that a certain level of independent test is performed outside of testing activities undertaken by the development team. During incremental development, no formal test procedures are developed. Functional tests that are executed on incremental releases provide the groundwork for the acceptance testing of the final product. Results of the testing are reported back to the developers through issues and discrepancy reports submitted through the Lotus Notes application identified as the Issue/Discrepancy Handling System (IDHS).

Prior to the final release, an internal test procedure is developed and followed. This test procedure is cross referenced with all of the element level requirements and the ISE system level requirements. Final release is dependent on the system passing 100% of the test cases executed.

6.1.2. Prototyping

During the analysis and design phases of the project, prototyping of the system is performed. Prototyping helps the user community identify and prioritize useful features. Rapid prototyping also provides critical functionality to the user community at an early date. Providing incremental releases is essential to meeting capability need dates for IV&V activities.

6.1.3. Integration

For each phase of product development there is a prototype release. Each prototype release focuses on a select group of features like data capture or reporting. The user community has an opportunity to use the prototypes and submit issues and discrepancy reports against them. These issues are reviewed by the Configuration Control Board (CCB) which consists of the Tool Lead, ISE Development Lead, and Task 4 Lead. Subsequent prototype releases incorporate changes as

6. DEVELOPMENT ACTIVITIES PLAN

6.1. Methodology and Approach

The methodologies selected for the development were the result of analysis of the system requirements, contract requirements, schedule constraints and resource constraints. An effort was made to minimize risk and provide a system with the highest degree of performance capability.

6.1.1. Development Engineering

The life cycle of the ISE software components follow a Spiral model where prototyping occurs during extended analysis and design phases and waterfall milestones are maintained as illustrated in Exhibit 1.1-1. Although, contractually, the responsibility of the developer ends at the System Testing phase, which is the acceptance testing of the deployed system, it is recognized that the ongoing maintenance and upgrading of the system will continue throughout the life of the system.

6.1.1.1. Analysis

System modeling and analysis follows a structured approach with the development of context diagrams, data flow diagrams and entity relationship diagrams using the Yourdon/DeMarco technique. Where there is time dependent behavior in the system, state transition diagrams are used as defined in Edward Yourdon's book "Modern Structured Analysis" by following the Ward & Mellor diagramming technique.

6.1.1.2. Design

In moving from the requirements analysis phase to the software design phase, related functions, data stores, and data flows are grouped into objects in adhering to an object oriented design approach. Object oriented design allows the most flexibility for incorporating new features and vastly improves maintainability.

Analysis and design activities are augmented by using the CASE tool System Architect by Popkin Software & Systems, Inc. This product supports the structured analysis and object oriented design approaches identified here. By using an object oriented design, common use libraries of object classes are defined that significantly reduce development time. Also, rapid prototyping is supported by the object oriented design approach. This means that an object oriented programming technique is supported for the code that is not generated by code generators.

The schedules for the development activities are shown in Section 4.3.1. The analysis and design phases are lengthened to provide for the prototype development activities. Each of the six development projects follow the same phases of development although the development time is

GFE, the Consent Package is sent to the NASA COTR for approval before sending a Purchase Order. If the purchase is a Contract Purchase the Consent Package is filed in the Program Office and a Purchase Order is sent to the vendor. For Capital Purchases, the purchase requisition is sent directly to the Intermetrics Corporate Purchasing Department and from there a Purchase Order is sent to the vendor.

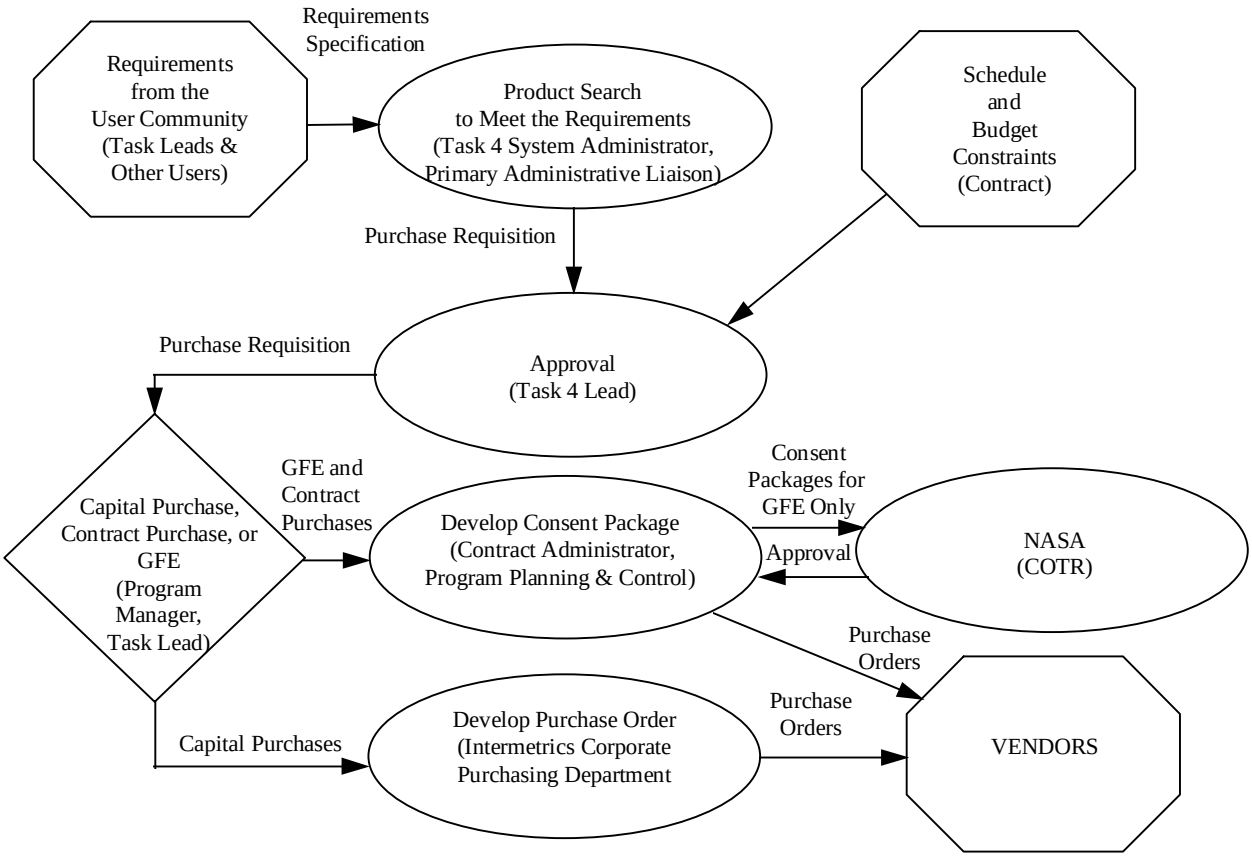

Exhibit 5.5-1 Government Furnished Equipment Acquisition Process

5.4. Technical Approach

The Task 4 team is responsible for all of the technical aspects of the procurement process. As shown in Exhibit 5.1-1, the Task 4 personnel perform needs/requirements analysis to gather information for the Integrated Support Environment (ISE) System Requirements document (CDRL 0404). A system architecture is developed to meet the requirements. As a part of this analysis, off the shelf products are evaluated to determine if they can be used as the configuration items of the system architecture. At the same time an evaluation of the cost and risk of development of the configuration items is performed. The technical team then makes recommendations to the Program Office.

When the Program Office determines that a configuration item will be developed instead of procured, the Task team determines what tools and training are required for the development process. The Task lead or tool lead requiring the development tools must write a tool justification report which is evaluated by Program Planning and Control, Business Operations and the Program Manager. The tool justification report provides the following information:

- tool name,
- vendor,
- overview of the tool's functions,
- cost per copy,
- amount and cost of training required,
- purpose for which the tool will be used,
- phase of the project that the tool is needed, and
- the expected benefit that the tool will provide to the project in terms of development efficiency.

5.5. Government Furnished Equipment (GFE)

For the purposes of this discussion Government Furnished Equipment (GFE) includes hardware, software and training since the procedure to follow for acquisition is the same. Exhibit 5.5-1 illustrates the procedure followed by Intermetrics in the acquisition of GFE, Contract Purchases (which are capital contracts that are depreciated against the contract) and Capital Purchases that are taken from the Intermetrics overhead and remain the property of Intermetrics.

Initially, the requirements of the user community are analyzed by the Task 4 technical team and a determination is made of products that can meet the need. Product performance and schedule are the main criteria at this level of analysis. Recommendations are made to the Primary Administrative Liaison (PAL) who develops a purchase requisition. The purchase requisition is reviewed by the Task 4 Lead who takes into consideration budget constraints as well as schedule. Upon Task Lead approval, the purchase requisition is sent to and reviewed with the Program Manager. At this point a determination is made whether to purchase the product as GFE, Contract Purchase or as a Capital Purchase. If the purchase will be GFE or a Contract Purchase, the purchase requisition is sent to the Contract Administrator under the Program Planning and Control function. The Contract Administrator develops a Consent Package. If the purchase is

Status / Tools	Freeware/ Shareware	COTS Procured	COTS Under Procurement	COTS Leading Candidate	To Be Developed	Procurement Period Ending
COTS Software						
RTM/Oracle		X				
SQLNet			PLX			6/95
BONeS		X				
DDTs				X		TBD
ClearCase				X		12/95
XRunner				X		6/95
LoadRunner				X		12/95
Xoftware				P		6/95
MS Office		PLM				
MS Project		PM				
ccMail		PL				
Lotus Notes		PL				
Adobe Acrobat	PL					
PVCS			P			12/95
SQLWindows			P			6/95
Sybase SQL Server			X			6/95
Open Client			PLX			6/95
System Architect				P		12/95
Visual C++		P				
Public Domain Software						
Mosaic	PLX					
Web Genera	X					
Acrobat Reader	PL					
Lotus Notes Applications						
Doc Production Tool					PL	
Data Management Tool					PL	
Tech Talk Tool					P	
Analysts Notebook Tool					PL	
RDBMS Applications						
Automated Requirements Data Base (ARDB)					P	
Interface Analysis Data Base (IADB)					P	
Test Management Data Base (TMDB)					P	
CARA Data Capture						P
ISE User I/F Applications						
Executive Interface					PLX	
Browser					PLX	

Legend:

X - Sun Solaris Platform , **P** - PC MS Windows Desktop, **L** - PC MS Windows Notebook
M - Macintosh

Exhibit 5.3-2 ISE Toolbox Tool Status

ISE COTS PRODUCTS CONTACT LIST

TOOLS	DEVELOPER	CONTACT	PHONE
System Architect	Popkin Software & Systems Incorporated 11 Park Place New York, New York 10007	Chad Moore	V (212) 571-3434 x206 F (212) 571-3436
Visual C++	Microsoft Corporation One Microsoft Way Redmond, Washington 98052	US Sales	V (800) 677-7377 F (800) 727-3351 internet http://www.microsoft.com
Xoftware	AGE Logic, Inc. 9985 Pacific Heights Blvd. San Diego, California 92121	Lisa Nidiffer	V (619) 455-8600 V (619) 550-3117 F (619) 597-6030 lmn@age.com
Xrunner	Mercury Interactive Corporation 405 Headquarters Drive, Suite 1 Millersville, Maryland 21108	Brad Williams	V (410) 987-7725 F (410) 987-7724 brad@merc-east.com

Exhibit 5.3-1 ISE COTS Tool Contact List

ISE COTS PRODUCTS CONTACT LIST

TOOLS	DEVELOPER	CONTACT	PHONE
			http://www.microsoft.com
MS Project	Microsoft Corporation One Microsoft Way Redmond, Washington 98052	US Sales	V (800) 677-7377 F (800) 727-3351 internet http://www.microsoft.com
Open Client	Sybase, Inc. 77 South Bedford Street Burlington, Massachusetts	John Bowen	V (800) 933-0044 x6491 F (617) 229-9845
PVCS	Intersolv, Inc. 3200 Tower Oaks Blvd. Rockville, Maryland 20852	John Cummings	V (800) 547-7827 x266 F (503) 629-0186 pvcsinfo@intersolv. com
RTM/Oracle	Marconi Systems Technology 4115 Pleasant Valley Road, Suite 100 Chantilly, Virginia 22021	Jodi Witmer	V (703) 263-1260 F (703) 263-1533
SQLNet	Oracle Corporation President's Plaza 196 Van Buren Street Herndon, Virginia 22070	Robin Owens-Wright Jabe Caldreth	V (800) 633-0584 V (703) 708-6580 F (703) 708-7922 rowen@us.oracle.com V (301) 907-2236
SQLWindows	Gupta Corporation 1060 Marsh Road Menlo Park, California 94025	 Maria Ploria Joe Jose Len Turtun SAIC, Gupta Partner	V (800) 444-8782 x627 x606 F (415) 617-4787 V (412) 892-4682
Sybase SQL Server	Sybase, Inc. 77 South Bedford Street Burlington, Massachusetts	John Bowen	V (800) 933-0044 x6491 V (800) 685-8225 F (617) 229-9845

ISE COTS PRODUCTS CONTACT LIST

TOOLS	DEVELOPER	CONTACT	PHONE
cc:Mail	Lotus Development Corporation 55 Cambridge Parkway Cambridge, Massachusetts 02142	US Sales	F (800) 346-3508 BBS (617) 693-7001 Data Bits = 8 No Parity Stop Bits = 1 Baud = 9600 Protocol = Xmodem, Ymodem or Zmodem
ClearCase	Atria Software Inc 2010 Corporate Ridge, Suite 700 McLean, Virginia 22102	James Riley	V (703) 749-1420 F (703) 749-1423 jriley@atria.com
DDTs	QualTrak Corporation 3160 De La Cruz Blvd, Suite 206 Santa Clara, California 95054	Mike Bushell	V (408) 748-9500 X123 F (408) 748-8468
LoadRunner	Mercury Interactive Corporation 405 Headquarters Drive, Suite 1 Millersville, Maryland 21108	Brad Williams	V (410) 987-7725 F (410) 987-7724 brad@merc-east.com
Lotus Notes	Lotus Development Corporation 55 Cambridge Parkway Cambridge, Massachusetts 02142	US Sales	F (800) 346-3508 BBS (617) 693-7001 Data Bits = 8 No Parity Stop Bits = 1 Baud = 9600 Protocol = Xmodem, Ymodem or Zmodem
MS Office	Microsoft Corporation One Microsoft Way Redmond, Washington 98052	US Sales	V (800) 677-7377 F (800) 727-3351 internet

Academic Community, the Scientific User Community, ISE Support Staff and NASA Project Personnel is solicited for system requirements. The Task 4 team is responsible for performing the technical analysis and tool evaluations, defining the system architecture, designing and developing the ISE system. The recommendations of the Task 4 team are evaluated by the Program Planning and Control and Business Operations functions as well as the Program Manager who are ultimately responsible for the procurement of all software and hardware while meeting contractual budgets and schedules.

5.3. Management Approach

As shown in Exhibit 5.1-1, the Program Planning and Control function along with the Business Operations function and the Program Manager receive Product Specifications and Tool Justification Reports from the Task 4 Technical Team. Evaluating these specifications and reports in reference to the impact that these products will have on the schedule and budget, they decide whether to procure the recommended product or require the technical team to develop a product to meet the requirements. Once a decision is made to procure a product, a schedule is established based on need and budget constraints. A list of COTS products with contact numbers is provided in Exhibit 5.3-1 and a list of the COTS products currently identified for procurement with the procurement period identified is provided in Exhibit 5.3-2. For a description of the tools and the functionality provided, refer to Section 5.2, Physical Architecture of the ISE System Architecture document.

ISE COTS PRODUCTS CONTACT LIST

TOOLS	DEVELOPER	CONTACT	PHONE
Adobe Acrobat	Adobe Systems Incorporated 1585 Charleston Road P.O. Box 7900 Mountain View, California 94039-7900	US Sales Adobe Developers Association	V (800) 833-6687 V (415) 961-4111 F (415) 967-9231
BONeS	Alta Group of Cadence Design Systems, Inc. 919 E. Hillsdale Boulevard Foster City, California 94404	Anne Purvis	V (415) 358-3624 F (415) 358-3603 anne@csi.com

5. ACQUISITION ACTIVITIES PLAN

5.1. Procurement Activities Plan

In its final implementation, the ISE will be approximately 80% configured Commercial Off The Shelf (COTS) software, 20% developed software. In addition to the acquisition of the COTS products that will be part of the final system, the procurement of design and development tools must be considered.

All procurement activities are managed and performed by the Program Planning and Control, and the Business Operations functions as shown in Exhibit 5.1-1. The Program Manager oversees the procurement activities and is responsible to review all acquisition recommendations and tool justification reports.

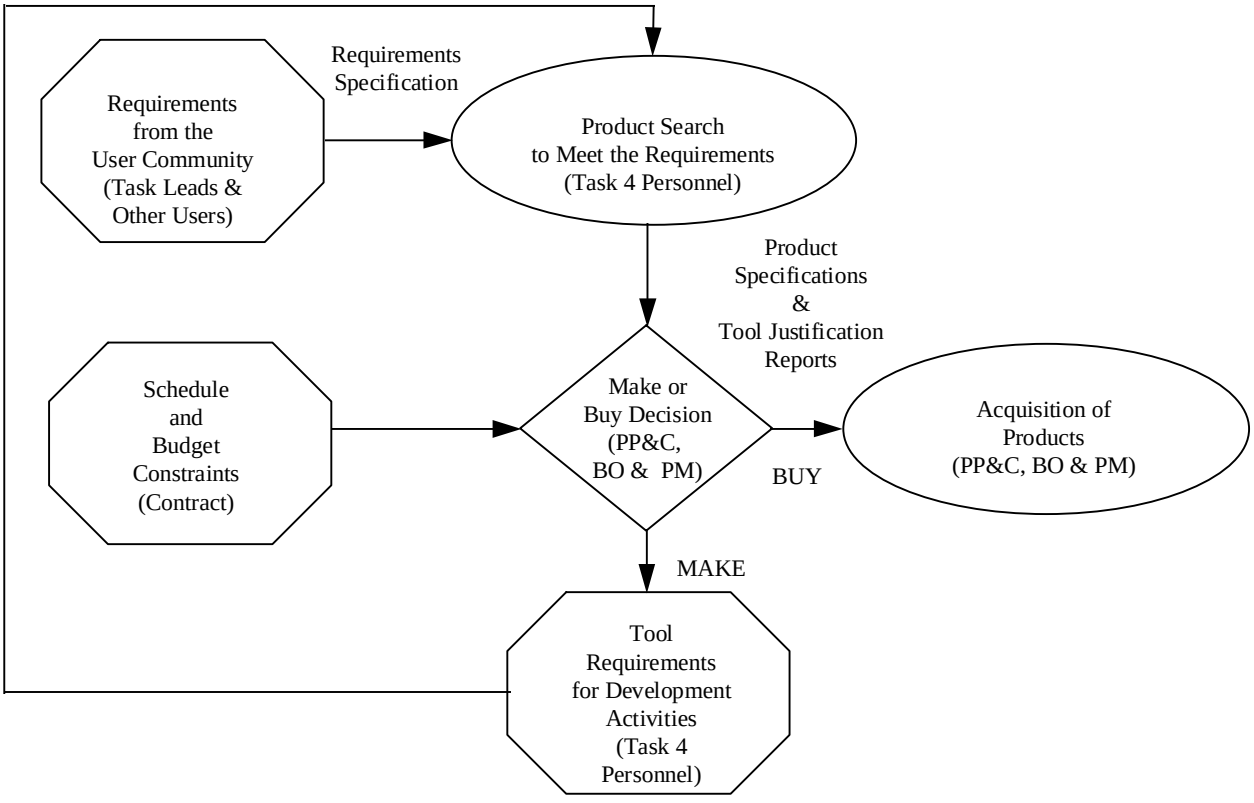

Exhibit 5.1-1 ISE Software Acquisition Process

5.2. Organizational Requirements and Life Cycle Adaptations

The ISE COTS Acquisition Process is graphically depicted in Exhibit 5.1-1. Organizationally, the user community which includes the IV&V task teams, the EOSDIS system developers, the

For additional information concerning the ISE network/computational infrastructure and the ISE Toolbox tools, refer to sections 5.2.1 and 5.2.2 of the ISE System Architecture Document dated 30 January 1995. Documentation in those sections details all of the hardware and software planned for incorporation into the ISE, including ISE development tools. For the procurement status information associated with COTS software, refer to Exhibit 5.3-1, ISE Toolbox Tool Status, in section 5.3 of this document.

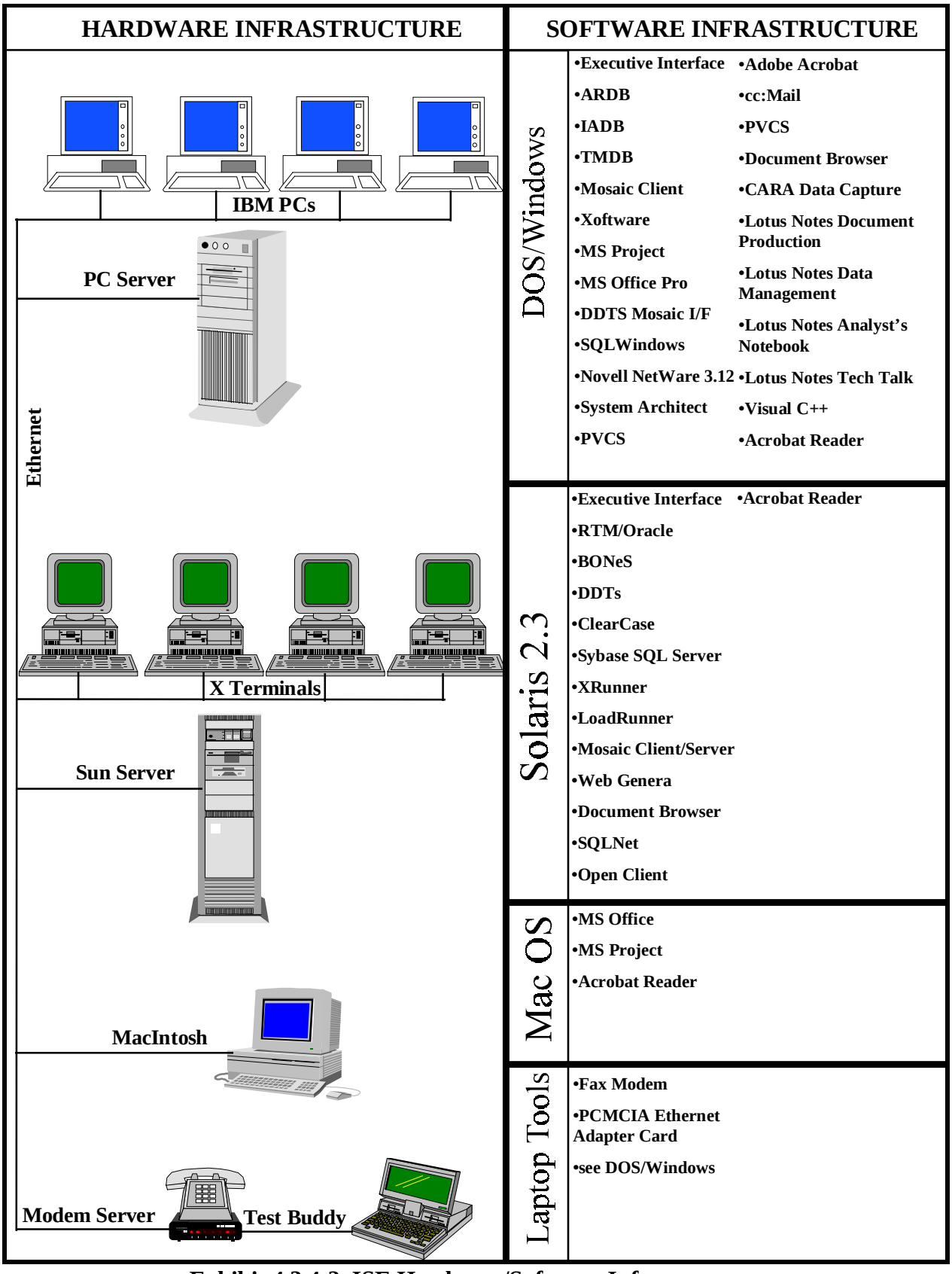

Exhibit 4.3.4-2 ISE Hardware/Software Infrastructure

storage. Exhibit 4.3.4-1 reflects the network/computational infrastructure of the ISE. Note that the infrastructure depicted also serves as the ISE development infrastructure.

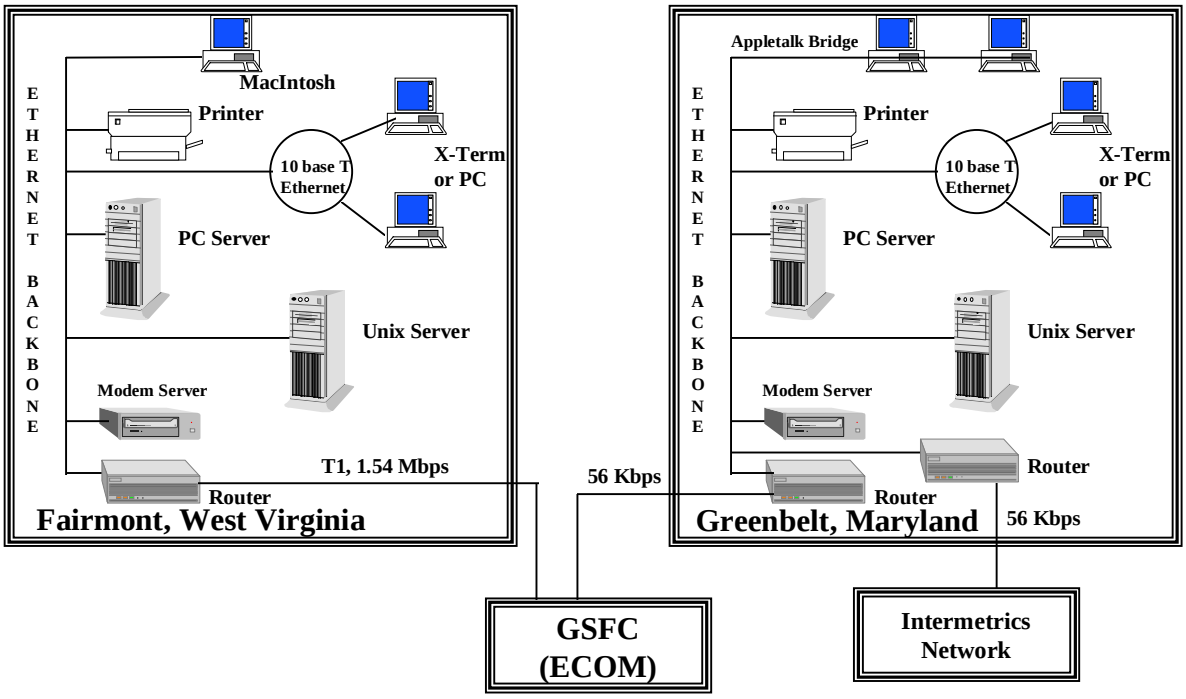

Exhibit 4.3.4-1 Network/Computational Infrastructure

The ISE system architecture reflects a networked heterogeneous environment incorporating several COTS products and a few developed or customized applications. The planned ISE system architecture, as depicted in Exhibit 4.3.4-2, provides a sound architectural foundation which is flexible and supportive for incrementally adding tools as new needs and requirements are levied against the ISE.

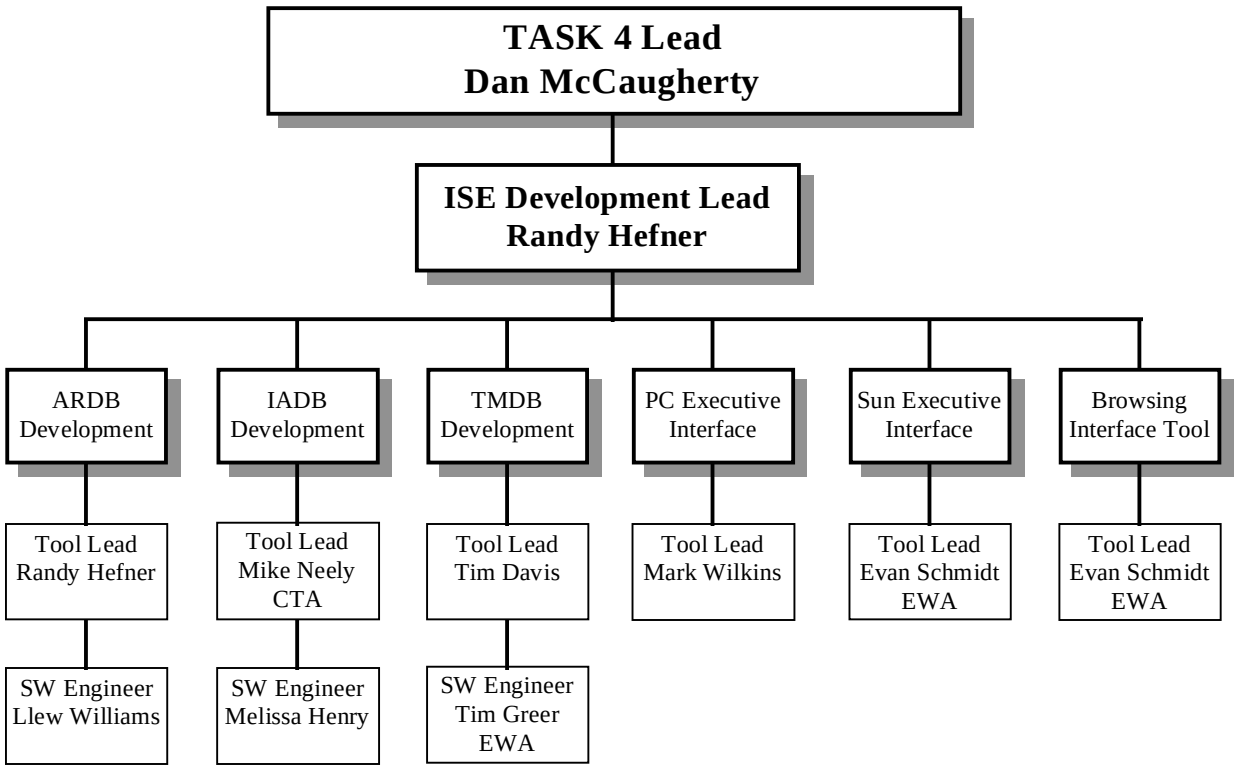

Exhibit 4.3.3-1 Infrastructure and Tools (Task 4) Organization Structure

4.3.4. Equipment

The design of the network infrastructure for the Integrated Support Environment is influenced by several factors. These design factors include user needs, location, communications, consistency, maintainability, and expandability. First and foremost, the network infrastructure must meet the needs of the ISE user community, regardless of location. This includes users at both the Fairmont, WV and Greenbelt, MD locations, as well as mobile users. Therefore, access to a particular tool or database is independent of location. This requires the infrastructure at both locations to be consistent and similar in design and implementation, thus promoting maintainability. The network infrastructure is also designed to provide the ability to communicate locally as well as between the two dispersed locations. Mobil users will also have the capability to dial-in to either network. Lastly, the network infrastructure is designed to accommodate changes and expansion due to changing user needs or technological advances.

The computational design is primarily influenced by the scope and nature of the IV&V tasks to be performed as well as the tools that are needed to perform those tasks. In addition to the current computational needs, consideration is given to expansion in terms of processing capabilities and

4.3.2. Funds and Budgets

The following fund and budget items are integral to ISE development:

- Labor
- Travel
- Tool Procurement
- Training

All of these budgets are managed at the EOSDIS IV&V program level where the individual Task Leads are granted access to budgets for planning purposes. This development plan is in compliance with all EOSDIS IV&V contract budgets as projected through June of 1996. Detailed monetary budget information is not provided in this plan.

4.3.3. Organization

Exhibit 4.3.3-1 reflects the organization hierarchy for the EOSDIS IV&V Infrastructure and Tools (Task 4) task. All Task 4 personnel depicted are located in the NASA/WVU Software IV&V Facility in Fairmont, WV with the exception of Mike Neely of CTA and Melissa Henry of ISyS. Both Mike Neely and Melissa Henry are located in the Intermetrics Greenbelt office to enhance communications between other EOSDIS IV&V personnel and the Task 4 Team. Dan McCaugherty, the Task 4 Lead, has overall responsibility for Task 4 and provides managerial expertise associated with ongoing Task 4 activities as well as the point of control for all ISyS related operations in the NASA/WVU Software IV&V Facility. Randy Hefner has assumed overall responsibility for meeting the ISE milestones and product deliveries detailed in section 4.3.1 of this plan. The remainder of the Task 4 organization structure corresponds to individuals allocated to development items associated with ISE development. For each development item, a Tool Lead and supporting staff has been identified. The Task 4 Team organization structure depicted reflects an engineering staffing level of between eight and nine individuals through 14 June 1996.

	Task Name	Start	Finish
1	**Browser Development**	**1/16/95**	**12/29/95**
2	**Analysis**	**1/16/95**	**5/19/95**
3	Analysis Activities	1/16/95	5/19/95
4	Mosaic HomePage Prototyping	1/16/95	5/19/95
5	Document Library Prototype Release	3/24/95	3/24/95
6	Requirements Document (Draft)	4/3/95	4/3/95
7	RID Prototype Release	4/24/95	4/24/95
8	Requirements Document (Final)	5/19/95	5/19/95
9	**Design**	**5/22/95**	**8/25/95**
10	Design Activities	5/22/95	8/25/95
11	Browser Prototyping	5/22/95	8/25/95
12	Search Prototype Release	6/28/95	6/28/95
13	Design Document (Draft)	7/14/95	7/14/95
14	Dynamic Configuration Prototype Release	8/18/95	8/18/95
15	Design Document (Final)	8/25/95	8/25/95
16	**Implementation**	**8/28/95**	**11/3/95**
17	Implementation Activities	8/28/95	11/3/95
18	User's Guide (Draft)	9/22/95	9/22/95
19	Full Featured Release	11/3/95	11/3/95
20	**Test**	**11/6/95**	**12/29/95**
21	Testing Activities	11/6/95	12/29/95
22	Acceptance Test Release	12/29/95	12/29/95
23	User's Guide (Final)	12/29/95	12/29/95
24	Version Description (Final)	12/29/95	12/29/95

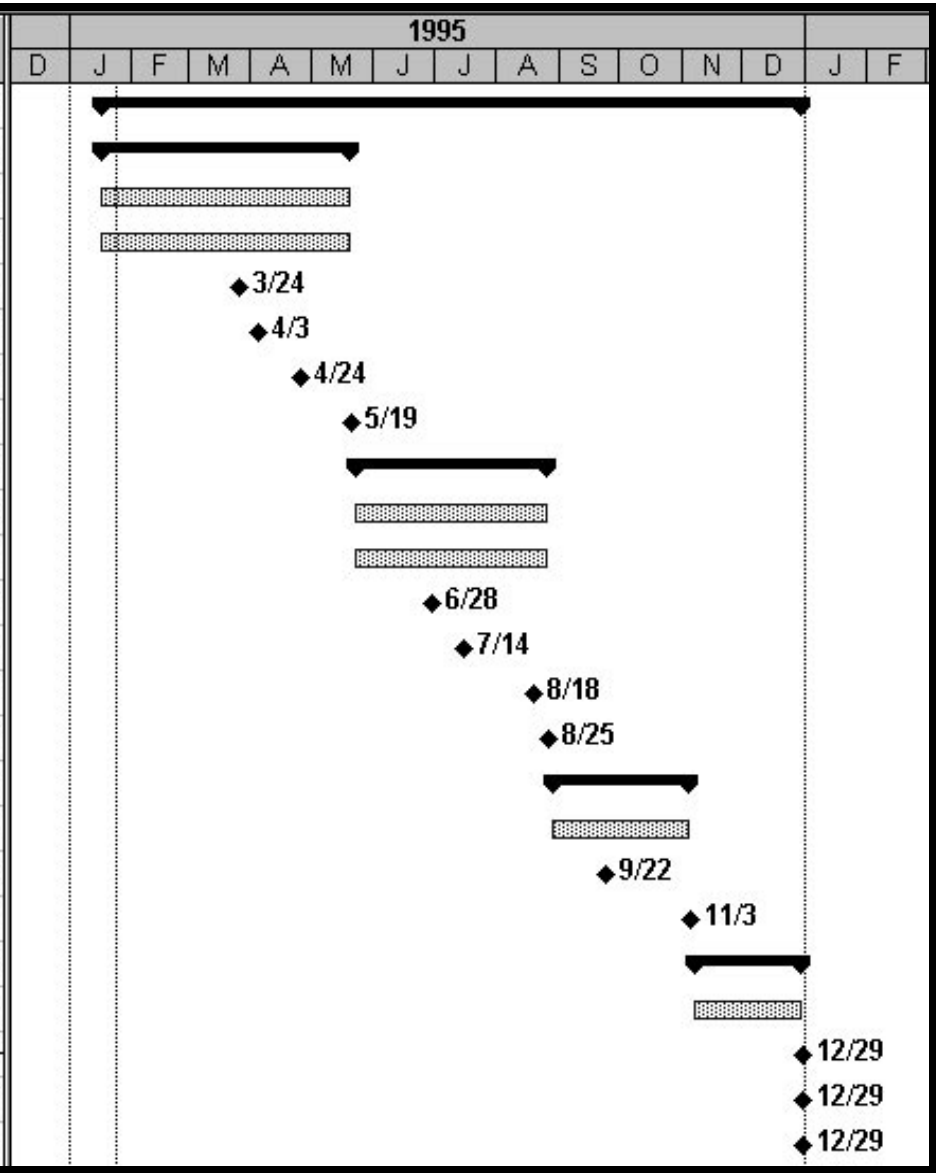

Exhibit 4.3.1.6-1 Data Browser Interface Development Schedule

4.3.1.6. DBI Development Schedule

The Data Browser Interface (DBI) provides ISE users access to EOSDIS IV&V deliverables, review item discrepancies (RIDs), and personnel contacts via a Mosaic interface. For additional details regarding ISE Browsers, refer to section 5.2.2.1.4.3.2 of the ISE System Architecture document.

The staffing level for DBI development corresponds to 1 individual at a 50 percent level of effort for the duration of the DBI development activities.

	Task Name	Start	Finish
1	**PC Executive Interface Development**	**4/3/95**	**5/31/96**
2	**Analysis**	**4/3/95**	**7/28/95**
3	Analysis Activities	4/3/95	7/28/95
4	User Groups/Access Definition	4/10/95	4/28/95
5	Hardware/Software Requirements Study	4/10/95	5/12/95
6	Internet Connection Prototype	5/15/95	6/16/95
7	Remote Dial-In Prototype	5/22/95	6/16/95
8	Requirements Document (Draft)	6/30/95	6/30/95
9	Requirements Document (Final)	7/28/95	7/28/95
10	**Design**	**7/31/95**	**10/27/95**
11	Design Activities	7/31/95	10/27/95
12	Design Document (Draft)	9/25/95	9/25/95
13	Design Document (Final)	10/27/95	10/27/95
14	**Implementation**	**10/30/95**	**3/1/96**
15	Implementation Activities	10/30/95	3/1/96
16	Prototype Release	12/29/95	12/29/95
17	User's Guide (Draft)	1/26/96	1/26/96
18	Full Featured Release	3/1/96	3/1/96
19	**Test**	**3/4/96**	**5/31/96**
20	Testing Activities	3/4/96	5/31/96
21	Acceptance Test Release	5/31/96	5/31/96
22	User's Guide (Final)	5/31/96	5/31/96
23	Version Description (Final)	5/31/96	5/31/96

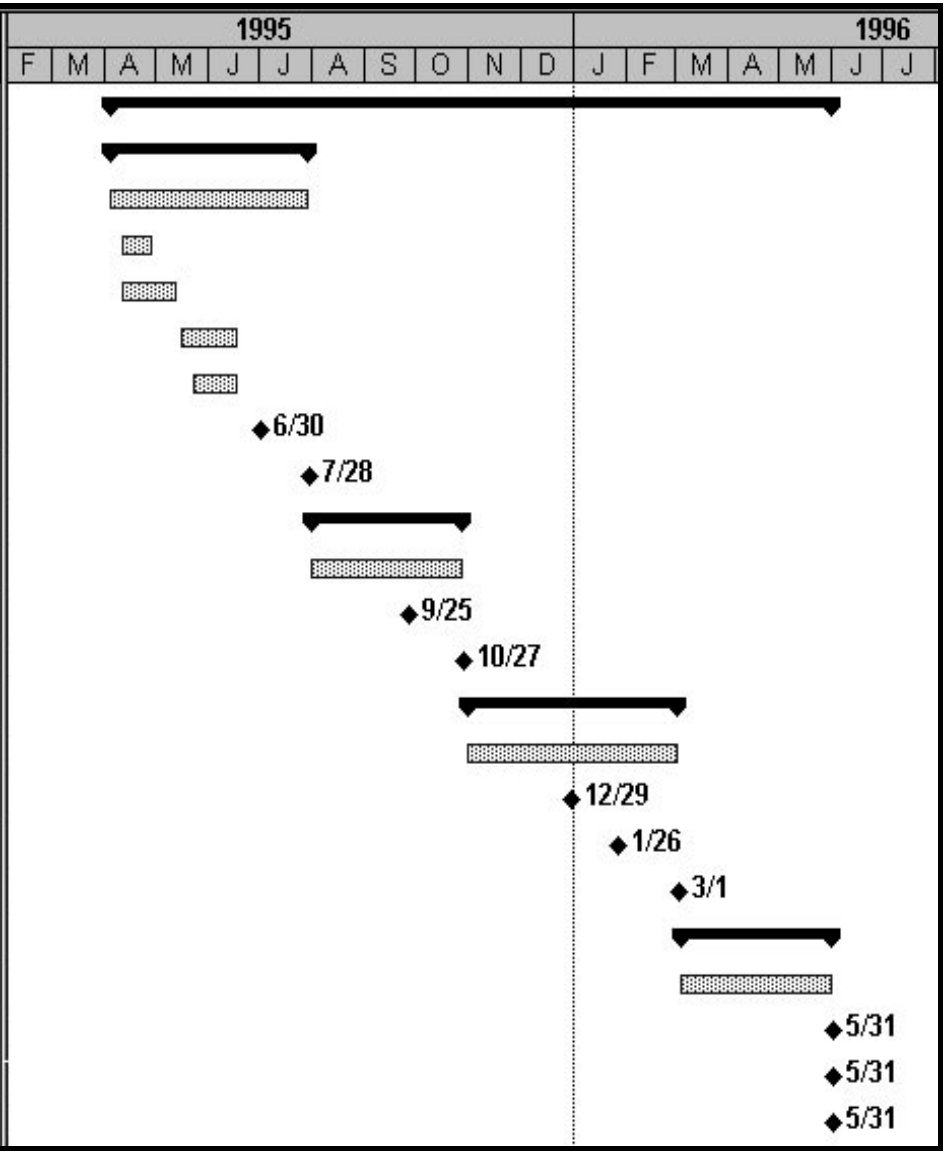

Exhibit 4.3.1.5-1 Sun Executive Interface Development Schedule

4.3.1.5. SEI Development Schedule

The Sun Executive Interface (SEI) customizes the Sun user interface based upon user login information. One of the primary functions of the SEI is to restrict access to ISE toolbox tools based upon class of user (i.e. IV&V analyst, NASA Integration, .etc.). During the analysis phases, implementation alternatives will be researched so that the optimal approach is taken based upon both Internet and dial-in access. A prototype release for this tool is not planned until late 1995. For additional details regarding ISE Executive Interfaces, refer to section 5.2.2.1.4.3.1 of the ISE System Architecture document.

The staffing level for SEI development corresponds to 1 individual at a 50 percent level of effort for the duration of the SEI development activities.

	Task Name	Start	Finish
1	**PC Executive Interface Development**	**4/3/95**	**5/31/96**
2	**Analysis**	**4/3/95**	**7/28/95**
3	Analysis Activities	4/3/95	7/28/95
4	User Groups/Access Definition	4/10/95	4/28/95
5	Hardware/Software Requirements Study	4/10/95	5/12/95
6	Internet Connection Prototype	5/15/95	6/16/95
7	Remote Dial-In Prototype	5/22/95	6/16/95
8	Requirements Document (Draft)	6/30/95	6/30/95
9	Requirements Document (Final)	7/28/95	7/28/95
10	**Design**	**7/31/95**	**10/27/95**
11	Design Activities	7/31/95	10/27/95
12	Design Document (Draft)	9/25/95	9/25/95
13	Design Document (Final)	10/27/95	10/27/95
14	**Implementation**	**10/30/95**	**3/1/96**
15	Implementation Activities	10/30/95	3/1/96
16	Prototype Release	12/29/95	12/29/95
17	User's Guide (Draft)	1/26/96	1/26/96
18	Full Featured Release	3/1/96	3/1/96
19	**Test**	**3/4/96**	**5/31/96**
20	Testing Activities	3/4/96	5/31/96
21	Acceptance Test Release	5/31/96	5/31/96
22	User's Guide (Final)	5/31/96	5/31/96
23	Version Description (Final)	5/31/96	5/31/96

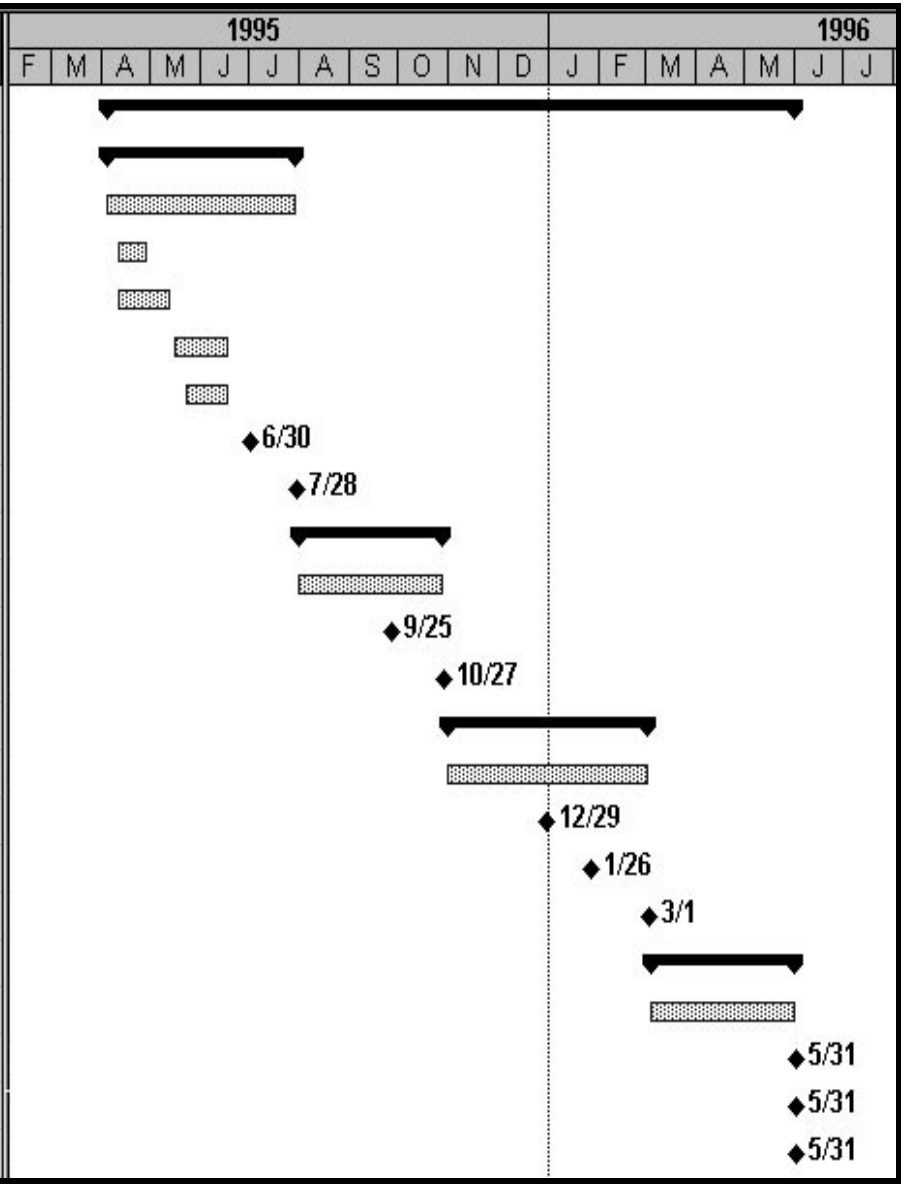

Exhibit 4.3.1.4-1 PC Executive Interface Development Schedule

4.3.1.4. PEI Development Schedule

The PC Executive Interface (PEI) customizes the PC user interface based upon user login information. One of the primary functions of the PEI is to restrict access to ISE toolbox tools based upon class of user (i.e. IV&V analyst, NASA Integration, .etc.). During the analysis phases, implementation alternatives will be researched so that the optimal approach is taken based upon both Internet and dial-in access. A prototype release for this tool is not planned until late 1995. For additional details regarding ISE Executive Interfaces, refer to section 5.2.2.1.4.3.1 of the ISE System Architecture document.

The staffing level for PEI development corresponds to 1 individual at a 50 percent level of effort for the duration of the PEI development activities.

	Task Name	Start	Finish
1	**TMDB Development**	**2/20/95**	**6/14/96**
2	**Analysis**	**2/20/95**	**7/20/95**
3	Analysis Activities	2/20/95	7/20/95
4	Data Capture Prototyping	2/20/95	7/20/95
5	Data Capture Prototype Release	5/1/95	5/1/95
6	Requirements Document (Draft)	6/20/95	6/20/95
7	Requirements Document (Final)	7/20/95	7/20/95
8	**Design**	**7/21/95**	**1/2/96**
9	Design Activities	7/21/95	1/2/96
10	Report Prototyping	7/21/95	1/2/96
11	Design Document (Draft)	10/2/95	10/2/95
12	Report Prototype Release	11/17/95	11/17/95
13	Design Document (Final)	12/15/95	12/15/95
14	**Implementation**	**1/3/96**	**4/16/96**
15	Implementation Activities	1/3/96	4/16/96
16	User's Guide (Draft)	3/15/96	3/15/96
17	Full Featured Release	4/15/96	4/15/96
18	**Test**	**4/17/96**	**6/14/96**
19	Testing Activities	4/17/96	6/14/96
20	Acceptance Test Release	6/14/96	6/14/96
21	User's Guide (Final)	6/14/96	6/14/96
22	Version Description (Final)	6/14/96	6/14/96

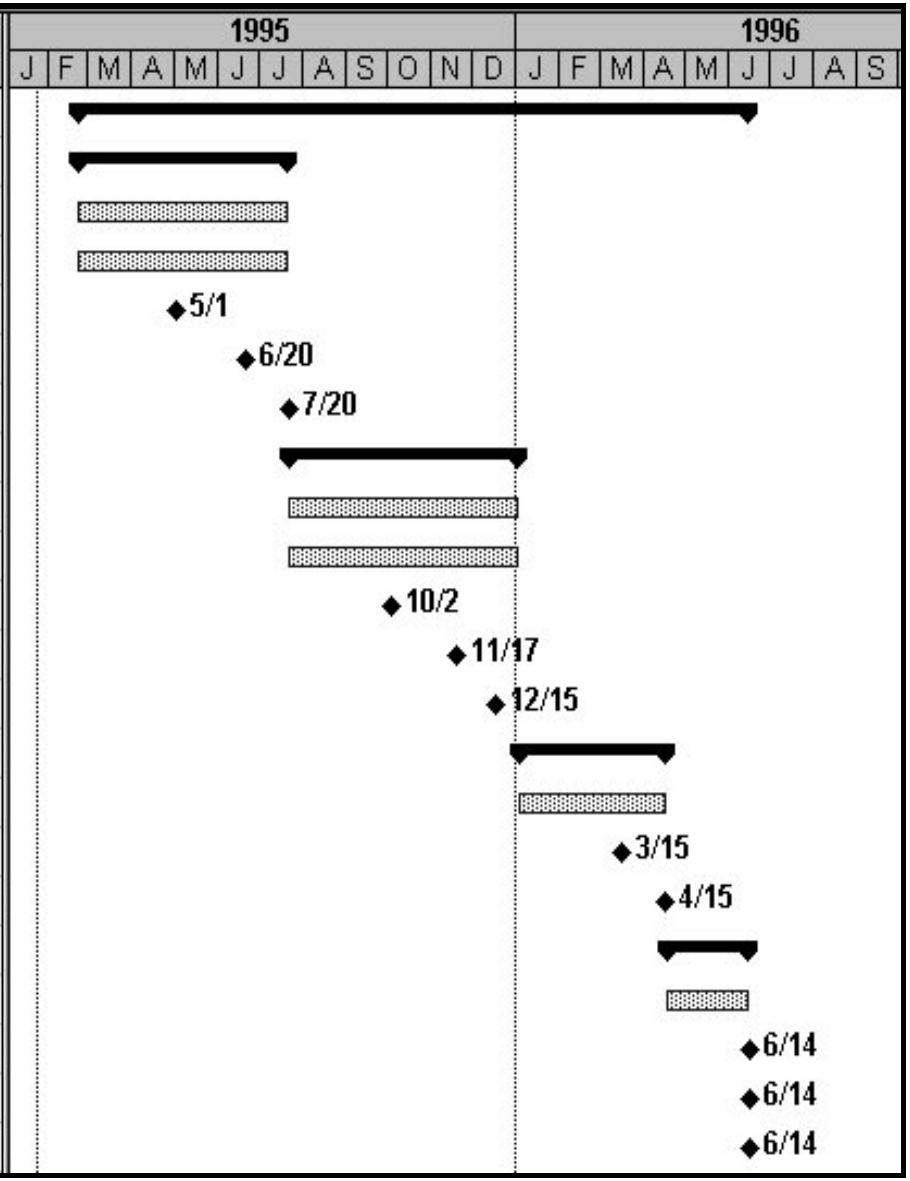

Exhibit 4.3.1.3-1 Test Management Data Base Development Schedule

4.3.1.3. TMDB Development Schedule

The Test Management Database (TMDB) application supports test planning, test execution, and test reporting. The client/server implementation will provide WAN capabilities enabling remote access and centralized database control. For additional details regarding RDBMS Client/Server Application development and the TMDB application, refer to sections 5.2.2.1.4.2 and 5.2.2.1.4.2.3 of the ISE System Architecture document.

In order to support test activities, incremental capabilities will be provided through two prototype releases. The first prototype release, denoted as the Data Capture Prototype Release, will provide data input capabilities so that test related data may stored in the Sybase SQL Server RDBMS. The second prototype release, denoted as the Report Prototype Release, will provide database reporting capabilities.

The staffing level for TMDB development corresponds to 2 individuals at a 80 percent level of effort for the duration of the TMDB development activities.

	Task Name	Start	Finish
1	**IADB Development**	**2/20/95**	**3/29/96**
2	**Analysis**	**2/20/95**	**6/15/95**
3	Analysis Activities	2/20/95	6/15/95
4	ICD Prototyping (Access)	2/20/95	6/15/95
5	ICD Prototype Release 1 (Access)	3/31/95	3/31/95
6	Requirements Document (Draft)	4/15/95	4/15/95
7	ICD Prototype Release 2 (Access)	5/31/95	5/31/95
8	Requirements Document (Final)	6/15/95	6/15/95
9	**Design**	**6/16/95**	**9/29/95**
10	Design Activities	6/16/95	9/29/95
11	SQLWindows/Sybase Prototyping	6/16/95	9/29/95
12	SQLWindows/Sybase Prototype Release 1	6/28/95	6/28/95
13	Design Document (Draft)	7/14/95	7/14/95
14	SQLWindows/Sybase Prototype Release 2	9/15/95	9/15/95
15	Design Document (Final)	9/29/95	9/29/95
16	**Implementation**	**10/2/95**	**12/29/95**
17	Implementation Activities	10/2/95	12/29/95
18	User's Guide (Draft)	11/30/95	11/30/95
19	Full Featured Release	12/29/95	12/29/95
20	**Test**	**1/2/96**	**3/29/96**
21	Testing Activities	1/2/96	3/29/96
22	Acceptance Test Release	3/29/96	3/29/96
23	User's Guide (Final)	3/29/96	3/29/96
24	Version Description (Final)	3/29/96	3/29/96

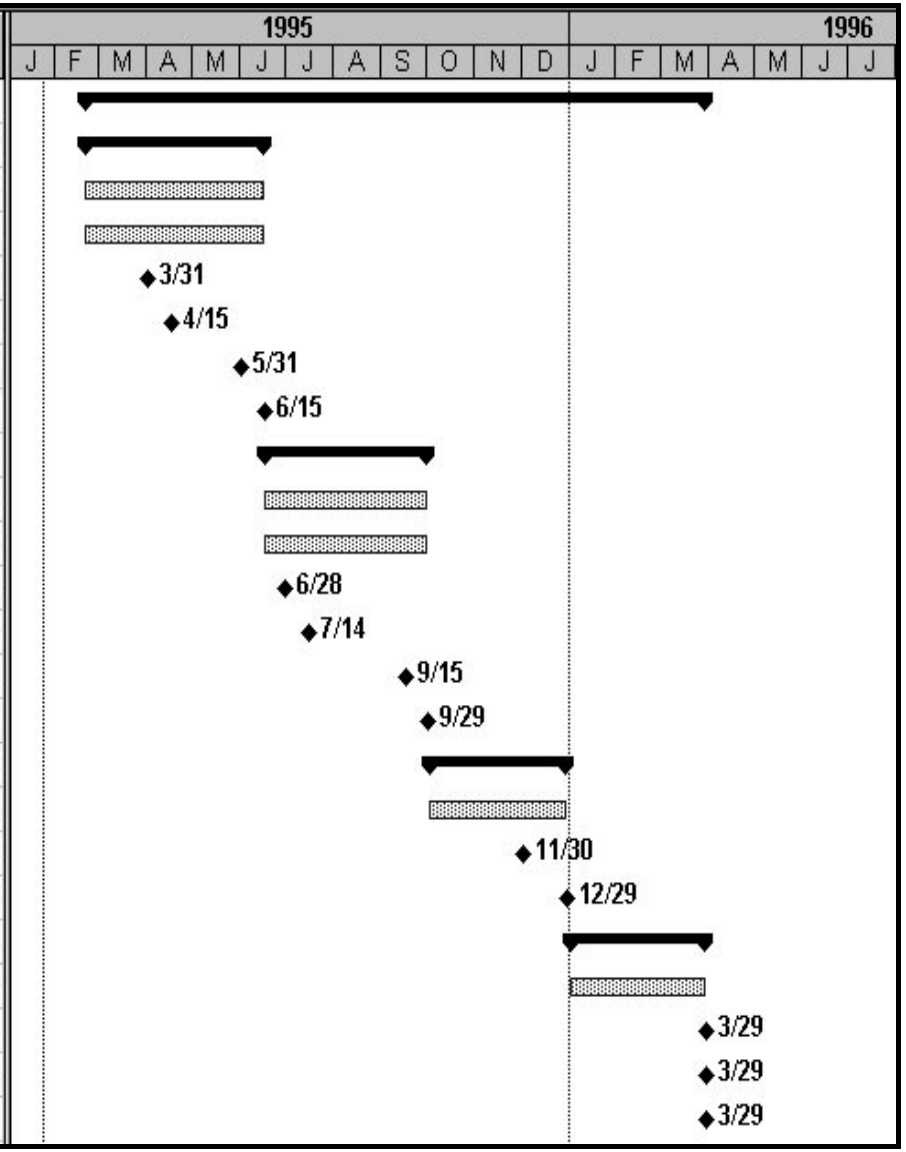

Exhibit 4.3.1.2-1 Interface Analysis Data Base Development Schedule

4.3.1.2. IADB Development Schedule

The Interface Analysis Database (IADB) application to be developed is an extension of the Access IADB interface analysis prototype. The Access IADB prototype will be used as a functional baseline for developing the client/server application so that all data associated with interface analysis activities is hosted in an RDBMS. The client/server implementation will provide WAN capabilities enabling remote access and centralized database control. For additional details regarding RDBMS Client/Server Application development and the IADB application, refer to sections 5.2.2.1.4.2 and 5.2.2.1.4.2.2 of the ISE System Architecture document.

In support of ongoing interface analysis activities, incremental capabilities will be provided through two prototype releases. The specific capabilities associated with each of these prototype releases is still yet to be determined. Unlike other Milestone 1 prototypes, the IADB Access prototype allows greater flexibility in porting IADB data to the ISE RDBMS, Sybase SQL Server. Since the prototype is based on the Microsoft Access relational database, some flexibility can be afforded to the tool lead in determining what capabilities will be available for each prototype release.

The staffing level for IADB development corresponds to 2 individuals at a 80 percent level of effort for the duration of the IADB activities.

	Task Name	Start	Finish
1	**ARDB Development**	**2/20/95**	**2/2/96**
2	**Analysis**	**2/20/95**	**5/19/95**
3	Analysis Activities	2/20/95	5/19/95
4	Data Capture Prototyping	2/20/95	5/19/95
5	Data Capture Prototype Release	3/24/95	3/24/95
6	Requirements Document (Draft)	4/17/95	4/17/95
7	Requirements Document (Final)	5/19/95	5/19/95
8	**Design**	**5/22/95**	**9/1/95**
9	Design Activities	5/22/95	9/1/95
10	Report Prototyping	5/22/95	9/1/95
11	Report Prototype Release	6/28/95	6/28/95
12	Design Document (Draft)	7/14/95	7/14/95
13	Design Document (Final)	8/11/95	8/11/95
14	**Implementation**	**9/4/95**	**12/15/95**
15	Implementation Activities	9/4/95	12/15/95
16	User's Guide (Draft)	11/30/95	11/30/95
17	Full Featured Release	12/15/95	12/15/95
18	**Test**	**12/18/95**	**2/2/96**
19	Testing Activities	12/18/95	2/2/96
20	Acceptance Test Release	2/2/96	2/2/96
21	User's Guide (Final)	2/2/96	2/2/96
22	Version Description (Final)	2/2/96	2/2/96

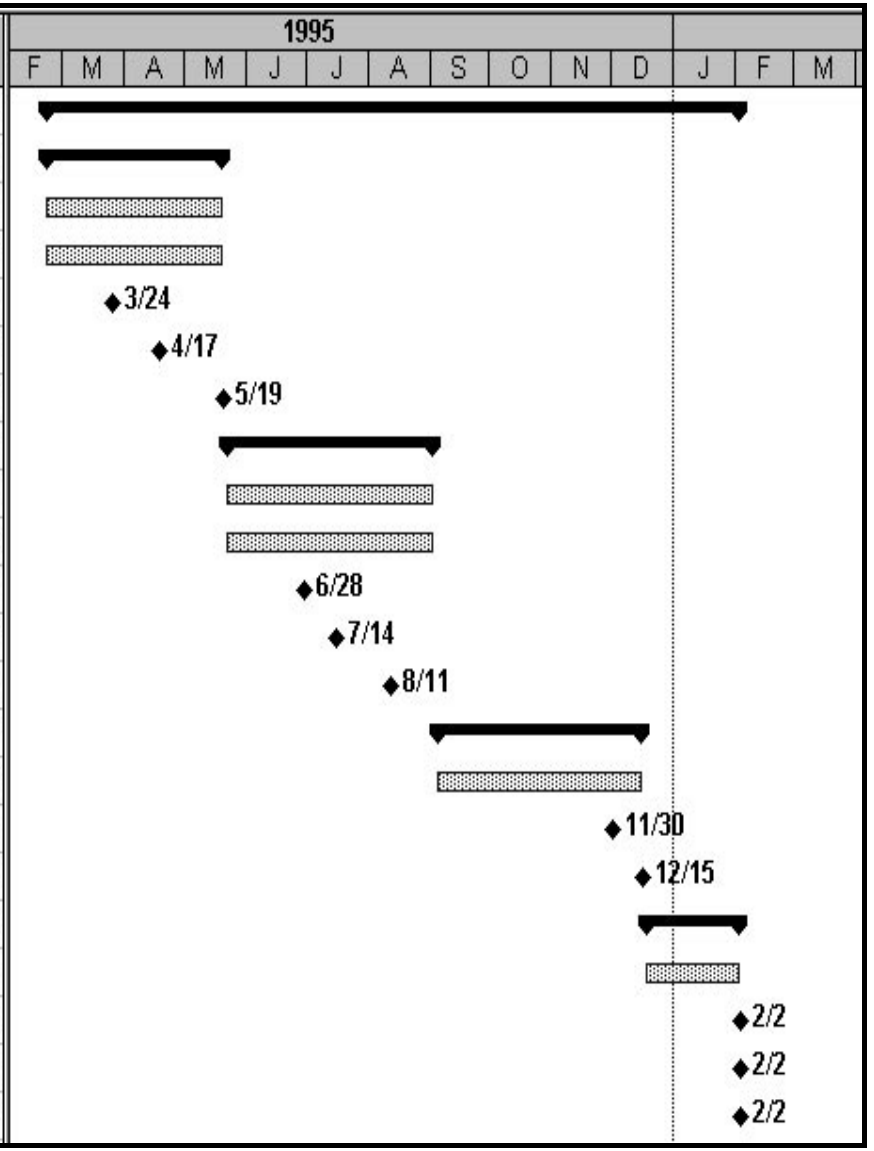

Exhibit 4.3.1.1-1 Automated Requirements Data Base Development Schedule

4.3.1.1. ARDB Development Schedule

The Automated Requirements Database (ARDB) application to be developed is an extension of the Excel/Word ARDB requirements analysis prototype. The Excel/Word ARDB prototype will be used as a functional baseline for developing the client/server application so that all data associated with requirements analysis activities is hosted in a Relational Database Management System (RDBMS). The client/server implementation will provide Wide Area Network (WAN) capabilities enabling remote access and centralized database control. For additional details regarding RDBMS Client/Server Application development and the ARDB application, refer to sections 5.2.2.1.4.2 and 5.2.2.1.4.2.1 of the ISE System Architecture document.

In support of ongoing requirements analysis activities, incremental capabilities will be provided through two prototype releases. The first prototype release, denoted as the Data Capture Prototype Release, will provide data input capabilities so that requirements analysis data may stored in the Sybase SQL Server RDBMS. The second prototype release, denoted as the Report Prototype Release, will provide database rollup accumulation and reporting capabilities.

The staffing level for ARDB development corresponds to 2 individuals. One engineer is scheduled at a 80 percent level of effort for the duration of the ARDB development activities. The other engineer is scheduled at a 50 percent level of effort for the duration of the ARDB development activities.

	Requirements (0408)	Design (0409)	User's Guide (0411)	CODE (0412)	VDD (0413)
SOW Deliverables	Draft 4/17/95 Update 7/28/95	Draft 7/14/95 Update 12/15/95	Draft 11/30/95 Update 5/31/96	Initial 2/16/96 Update 6/14/96	Initial 2/16/96 Update 6/14/96
ARDB	Draft 4/17/95 Update 5/19/95	Draft 7/14/95 Update 8/11/95	Draft 11/30/95 Update 2/2/96	Initial 12/15/95	Initial 2/2/96
IADB	Draft 4/15/95 Update 6/15/95	Draft 7/14/95 Update 9/29/95	Draft 11/30/95 Update 3/29/96	Initial 12/29/95	Initial 3/29/96
DBI	Draft 4/3/95 Update 5/19/95	Draft 7/14/95 Update 8/25/95	Draft 9/22/95 Update 12/29/95	Initial 11/3/95	Initial 12/29/95
TMDB	Draft 6/20/95 Update 7/20/95	Draft 10/2/95 Update 12/15/95	Draft 3/15/96 Update 6/14/96	Initial 4/15/96	Initial 6/14/96
PEI	Draft 6/30/95 Update 7/28/95	Draft 9/25/95 Update 10/27/95	Draft 1/26/96 Update 5/31/96	Initial 3/1/96	Initial 5/31/96
SEI	Draft 6/30/95 Update 7/28/95	Draft 9/25/95 Update 10/27/95	Draft 1/26/96 Update 5/31/96	Initial 3/1/96	Initial 5/31/96

Note: The lightly shaded development item milestones are for internal monitoring purposes only. No formal deliverable is generated.

Exhibit 4.3.1-2 ISE Document/Code Deliverable Schedule

In addition to the review, demonstration, and incremental release milestones denoted in the ISE development schedule, documentation and code deliverables are reflected in the SOW deliverables row of Exhibit 4.3.1.-2. For each document type (e.g. element requirements), one document will be generated containing the corresponding information for each of the six development items. Typically, a deliverable document will be released in DRAFT form containing information pertaining to only a portion of the six development items since these development items are phased differently. Whereas, the UPDATE of each document includes complete information for all six development items.

	Task Name	Start	Finish
1	**ISE Development**	**1/16/95**	**6/14/96**
2	Milestone 1 Release 2 (M1R2) Demo	2/16/95	2/16/95
3	Milestone 1 Release 3 (M1R3) Demo	5/31/95	5/31/95
4	ISE System Design Review	8/18/95	8/18/95
5	ISE Release 1 (ISER1) Demo	2/16/96	2/16/96
6	ISE Release 2 (ISER2) Demo	6/14/96	6/14/96
7	PC Executive Interface Development	4/3/95	5/31/96
8	Report Prototype Release	12/29/95	12/29/95
9	Full Featured Release	3/1/96	3/1/96
10	Acceptance Test Release	5/31/96	5/31/96
11	Sun Executive Interface Development	4/3/95	5/31/96
12	Report Prototype Release	12/29/95	12/29/95
13	Full Featured Release	3/1/96	3/1/96
14	Acceptance Test Release	5/31/96	5/31/96
15	Browser Development	1/16/95	12/29/95
16	Document Library Prototype Release	3/24/95	3/24/95
17	RID Prototype Release	4/24/95	4/24/95
18	Search Prototype Release	6/28/95	6/28/95
19	Dynamic Configuration Prototype Release	8/18/95	8/18/95
20	Full Featured Release	11/3/95	11/3/95
21	Acceptance Test Release	12/29/95	12/29/95

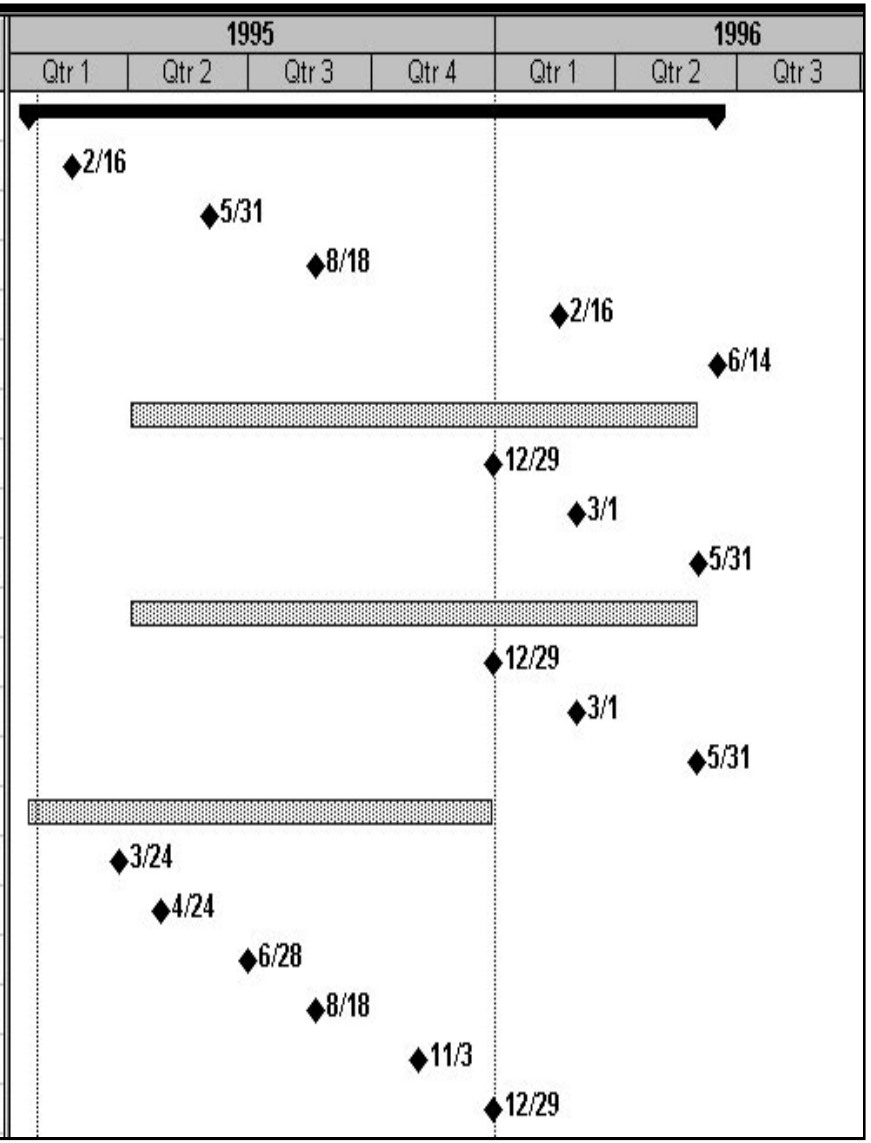

Exhibit 4.3.1-1 ISE Development Schedule (Sheet 2 of 2)

	Task Name	Start	Finish
1	**ISE Development**	**2/16/95**	**6/14/96**
2	Milestone 1 Release 2 (M1R2) Demo	2/16/95	2/16/95
3	Milestone 1 Release 3 (M1R3) Demo	5/31/95	5/31/95
4	ISE System Design Review	8/18/95	8/18/95
5	ISE Release 1 (ISER1) Demo	2/16/96	2/16/96
6	ISE Release 2 (ISER2) Demo	6/14/96	6/14/96
7	ARDB Development	2/20/95	2/2/96
8	Data Capture Prototype Release	3/24/95	3/24/95
9	Report Prototype Release	6/28/95	6/28/95
10	Full Featured Release	12/15/95	12/15/95
11	Acceptance Test Release	2/2/96	2/2/96
12	IADB Development	2/20/95	3/29/96
13	ICD Prototype Release 1 (Access)	3/31/95	3/31/95
14	ICD Prototype Release 2 (Access)	5/31/95	5/31/95
15	SQLWindows/Sybase Prototype Release 1	6/28/95	6/28/95
16	SQLWindows/Sybase Prototype Release 2	9/15/95	9/15/95
17	Full Featured Release	12/29/95	12/29/95
18	Acceptance Test Release	3/29/96	3/29/96
19	TMDB Development	2/20/95	6/14/96
20	Data Capture Prototype Release	5/1/95	5/1/95
21	Report Prototype Release	11/17/95	11/17/95
22	Full Featured Release	4/15/96	4/15/96
23	Acceptance Test Release	6/14/96	6/14/96

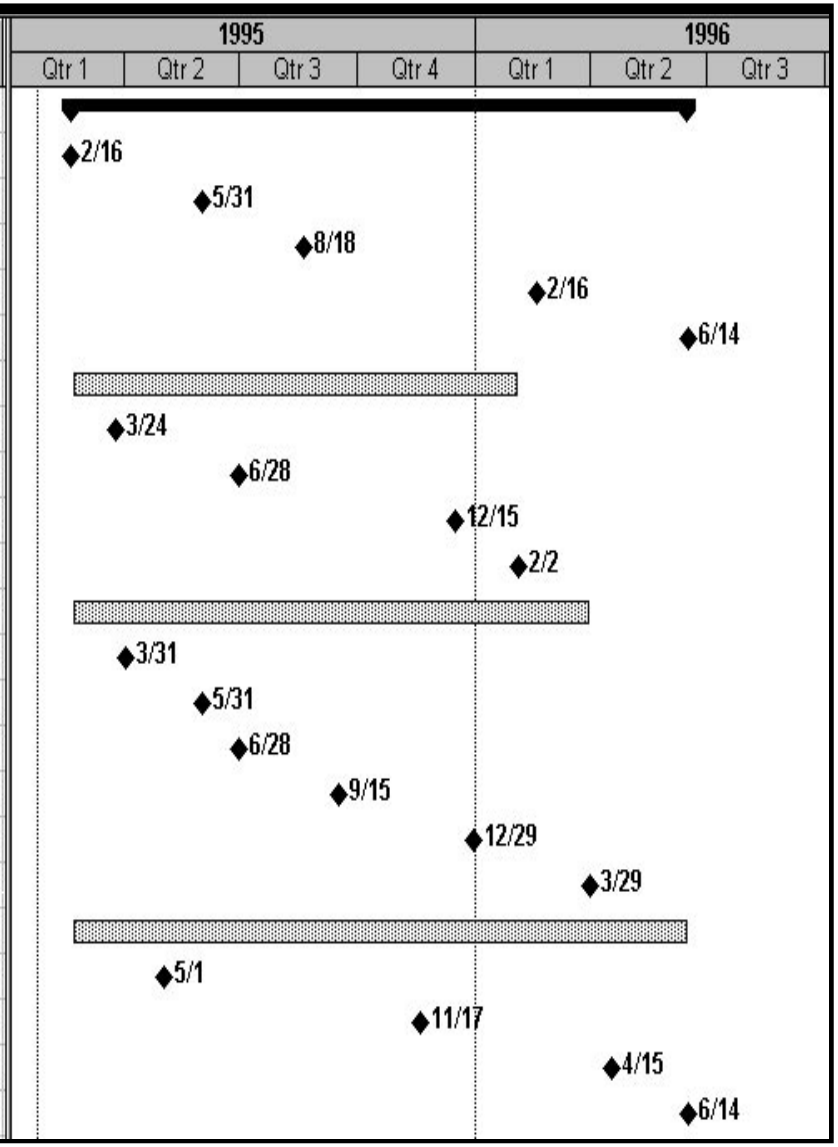

Exhibit 4.3.1-1 ISE Development Schedule (Sheet 1 of 2)

required to establish the ISE and support ongoing IV&V analysis. Staffing for the Infrastructure and Tools task (Task 4) remains fairly constant at between eight and nine engineers for the duration of the task order. The ISE Development schedule reflected in Exhibit 4.3.1-1 identifies significant ISE milestones through 14 June 1996 and is the parent schedule to the development item schedules which follow in subsequent subsections. The ISE parent schedule depicted includes incremental, fully functional, and acceptance test release dates for each of the 6 development items. Two incremental releases for the ISE are also slated for 16 February 1996 and 14 June 1996, respectively. As of 14 June 1996, it is the intent that the configured ISE architecture support EOSDIS IV&V infrastructure and tool needs for the duration of the IV&V contract.

4.2. Work Breakdown Structure (WBS)

Various WBS levels exist within the EOSDIS IV&V contract. The EOSDIS IV&V program level WBS is managed by Program Management via support from the (1) Program Planning and Control and (2) Business Operations functions as depicted in Exhibit 4.1.1-1, EOSDIS IV&V Organization. It is at that level that cost projections verses actuals are monitored for each task order issued.

At the Task 4 level, engineering resources are allocated according to planned and scheduled development activities. In essence, the highest level WBS items for Task 4 correspond to the individual Computer Software Configuration Items (CSCIs) identified for development. New development associated with the establishment of ISE has resulted in the identification of the following CSCIs:

- Automated Requirements Database (ARDB) CSCI
  Refer to the ARDB CSCI development schedule in section 4.3.1.1 for lower level development item WBS activities.
- Interface Analysis Database (IADB) CSCI
  Refer to the IADB CSCI development schedule in section 4.3.1.2 for lower level development item WBS activities.
- Test Management Database (TMDB) CSCI
  Refer to the TMDB CSCI development schedule in section 4.3.1.3 for lower level development item WBS activities.
- PC Executive Interface (PEI) CSCI
  Refer to the PEI CSCI development schedule in section 4.3.1.4 for lower level development item WBS activities.
- Sun Executive Interface (SEI) CSCI
  Refer to the SEI CSCI development schedule in section 4.3.1.5 for lower level development item WBS activities.
- Data Browser Interface (DBI) CSCI
  Refer to the ARDB CSCI development schedule in section 4.3.1.6 for lower level development item WBS activities.

4.3. Resource Estimation

The following subsections detail the development item schedules and resources required for the establishment of the ISE in terms of personnel, facilities, COTS, freeware, and GFE.

4.3.1. Schedules

In establishing the ISE, development areas including data and tool integration have been targeted to obtain benefits such as information sharing, increased productivity, data integrity, and analysis repeatability. Development has been constrained to these areas based upon the limited engineering resources available to perform development in conjunction with other activities

These reports are submitted by each individual assigned to Task 4 so that progress made towards scheduled milestones may be monitored. Information detailed in the report includes activities performed, planned activities, and issues or problems encountered.

- ISE Issue/Discrepancy Reports
  Issue/Discrepancy reports entered against the ISE are maintained in a Lotus Notes database for monitoring and tracking. The Issue/Discrepancy Handling System (IDHS) Lotus Notes application provides a forum for the IV&V task leads to communicate ISE related needs and concerns to the Task 4 team. Information maintained for each issue/discrepancy includes the originator, identifier, subject, description, status, etc.. Different views and reports of the database are used for monitoring issues through closure.
- Software Problem Reports
  Once an ISE tool under development is baselined, changes to the tool are incorporated via adherence to a configuration control process. The mechanism for initiating and tracking software changes is through the use of a Software Problem Report (SPR). An SPR includes title, submitter, tracking dates, resolver, approval information, problem description, units/documents affected, recommended solution, actual solution, etc..
- Configuration Status Reports
  A Configuration Status Report is generated following a configuration status audit and contains status information for each COTS or developed tool under configuration control. Configuration status audits are performed for each ISE release.
- Development Item Test Reports
  Development item test reports are generated during acceptance testing activities for each Computer Software Configuration Item (CSCI). The test report contains pass/fail information for executed tests. Where failures are identified, the associated SPRs are identified.

Throughout the analysis and design phases, each system to be developed is prototyped with incremental capabilities. These incremental prototype releases are used by the development team as well as the other IV&V tasks so that their value can be assessed and design inputs may be garnered. Since the spiral model process invites creeping featurism and uncontrolled addition of requirements, the prioritization of requirements and allocation of resources must be managed very carefully. An Issue/Discrepancy Handling System (IDHS) is used to log all issues relating to the ISE configuration items. These prioritized issues are reviewed weekly at the weekly status meeting. The ISE Development Lead will allocate resources and realign priorities according to newly submitted issues as required. Schedule impacts associated with opened issues will be identified and reported via the established monthly program reporting channels. In the event that submitted issues could result in missing scheduled milestones, the corresponding issues will be reported to the COTR through the Monthly Program Status Report.

opened, and are responsible for the planning, technical direction, management and reporting associated with individual tasks.

Management practices, tasks, and activities associated with developing the ISE under the EOSDIS IV&V Infrastructure and Tool Development Task (Task 4) include:

- Resource Identification
- Development Item Planning
- Development Scheduling
- Weekly Task Status Meetings
- Weekly Engineering Status Reports
- Monthly Program Status Reports
- Bi-Monthly Program Status Reviews

4.1.2. Method and Approach

The project management activities are handled by the management team consisting of the Task Team for Task 1 and the Task Team Leader for Task 4 of the EOSDIS IV&V Contract. Task 1 is the IV&V Project Management task that is responsible for managing the programmatic activities for all tasks of the EOSDIS IV&V task order contract. The Task 1 Lead is responsible for financial and business planning, oversight, assessment and analysis, including oversight of the development of 533M and 533Q reports. Task 1 also manages performance assurance activities, configuration management, and IV&V Project-level Configuration Control Board activities which shall be accomplished in accordance with the Performance Assurance Requirements, GSFC 420-05-05. The bimonthly Program Status Reviews are prepared by Task 1 personnel with Task 4 personnel participation.

4.1.3. Reporting, Monitoring, and Revision

There are two levels of reporting for task monitoring. The administrative reports are provided at the program level by Task 1 and the technical reports are provided at the task level by the Task 4 Lead designees. For the technical reports, a brief overview of the purpose and contents of the report has been included.

- Administrative Reports
    - Monthly Program Status Reports
    - Financial Reports (533M and 533Q)
    - Significant Event Reports
    - Performance Assessment Summary

- Technical Reports
    - Weekly Engineering Status Reports

IV&V of EOSDIS will be conducted by a team of technical professionals under the leadership of Intermetrics Systems Services (ISyS) Corporation, the prime contractor. Subcontractor members of the IV&V Team include CTA Incorporated, SM Systems and Research Corporation (SMSRC), and Electronic Warfare Associates (EWA). The team is fully integrated and collocated at facilities in Greenbelt, Maryland and Fairmont, West Virginia. Exhibit 4-1 identifies the senior EOSDIS IV&V representative for each team member and principal areas of responsibility. These assignments are fully consistent with established expertise held by the team members and reflect the basic decomposition of the EOSDIS IV&V effort into activities associated with:

- Project infrastructure (management, organizational interfaces, planning, and tools),
- Functional and performance requirements (systems and interfaces),
- Life-cycle verification (concept through implementation phases), and
- Certification (i.e., validation) of components, interfaces and systems.

TEAM MEMBER	SENIOR REPRESENTATIVE	AREAS OF EXPERTISE
ISyS	Mr. Ron Cariola	• Overall Project Management • Planning • Organizational Interfaces • Life-Cycle Verification • System Requirements • Component Certification • System Certification • Science Systems Integrity • V&V Tools
CTA	Dr. Roland Weiss	• Organizational Interfaces • Life-Cycle Verification • Interface Requirements • Key Interface Certification
SMSRC	Dr. Ashit Sanyal	• Science Requirements • Science User Community Interfaces
EWA	Mr. Earl Atkins	• Life-Cycle Verification

Exhibit 4.1.1-2 IV&V Team Composition

Intermetrics has structured its EOSDIS IV&V organization with the objectives of providing stable and consistent direction at the project level, establishing focal points for major technical areas within EOSDIS, and maintaining direct accountability/responsibility at the task level. At the top levels of the organizational hierarchy are the project management, planning and control, and business operations functions. These functions operate independent of specific task orders and provide day-to-day continuity and direction for the project. The Functional Area Leads (FALs) provide identifiable and recognizable focal points for specific areas chosen because of their importance to the success of EOSDIS and the IV&V effort. Task leads are assigned as tasks are

4. RESOURCES, BUDGETS, SCHEDULES, AND ORGANIZATION

This section describes the business aspects of the software acquisition and development. This includes the supporting organizational infrastructure and management techniques employed to facilitate timely deployment of the final product within established budgets. For the purposes of this document budgets will be discussed in terms of personnel and product resources. Budgets in terms of dollars and labor rates are handled by management level tasks for the EOSDIS IV&V contract.

4.1. Business Practices Definition and Revision Process

4.1.1. Definition of Activities

The establishment of the ISE falls within the scope of the EOSDIS IV&V Infrastructure and Tool Development Task (Task 4) which is one of the many tasks issued under the EOSDIS IV&V task order contract. Exhibit 4.1.1-1, EOSDIS IV&V Organization reflects the EOSDIS IV&V organization hierarchy.

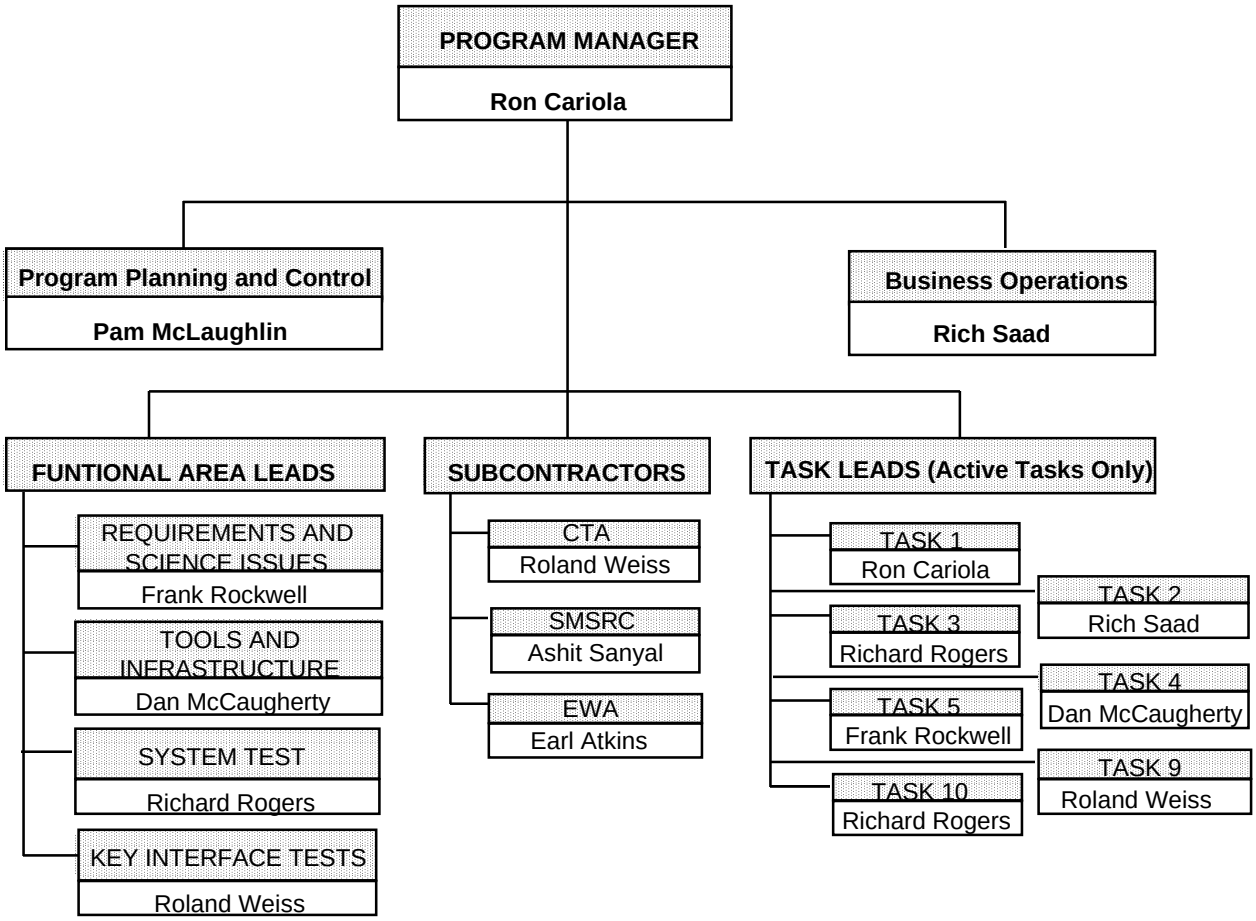

Exhibit 4.1.1-1 EOSDIS IV&V Organization

Because of the variety of information that exists in the IIR, not all users have access to all information. System level security is maintained and individual user access is on a need to know basis. Although the type of user matters, the location of the user does not. The IIR will be located at the WVU/NASA Software IV&V Center in Fairmont, West Virginia and accessible to the IV&V user community, regardless of their location, via the established communication architecture.

The user interface to the IIR is provided by front-end tools located in the ISE Toolbox. The Toolbox compartmentalizes all of the tools to meet the diverse needs of the ISE users and can be broadly characterized as follows:

- Information browsing tools
- Database application tools
- Analysis tools
- Tracking tools
- Testing tools
- Development tools
- Office automation tools

Front-end tools enable users to access the data and products stored in the IIR while providing a standard look and feel for navigating through the IIR. The Toolbox also contains office support tools, project management tools, test tools, performance and code analyzing tools, and interface analysis tools to support the daily needs of the IV&V task members. Where feasible, these tools are integrated to facilitate the sharing of data, enabling information to progress through the IV&V project life-cycle. Additionally, the Toolbox houses the tools necessary for the ISE support staff to establish and maintain the ISE. These tools are used to allow ISE support staff to develop new tools, manage, monitor and maintain computational resources, and perform configuration management of tools and data.

3.3. ISE System Architecture

A complete description of the physical architecture of the ISE is provided in Section 5.2 of the ISE System Architecture document (CDRL 0405).

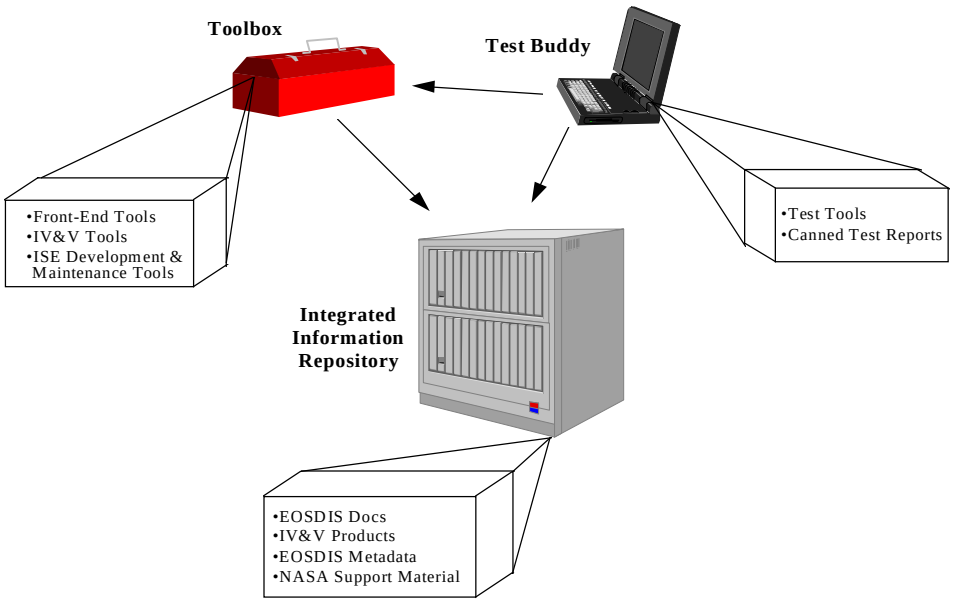

Exhibit 3.2-1 ISE Components

Exhibit 3.2-2 maps the identified objectives to the components of the ISE and indicates how the objectives are satisfied.

OBJECTIVE	COMPONENT	OBJECTIVE SATISFACTION
• Provide tool support for IV&V tasks	Toolbox	• The Toolbox houses IV&V tools to support daily needs
• Provide visibility to EOSDIS IV&V products, results, and data	Integrated Information Repository and Toolbox	• The IIR archives all EOSDIS IV&V products and data • The Toolbox provides front-end tools to access these products and data
• Provide visibility to EOSDIS development and integration documentation	Integrated Information Repository and Toolbox	• The IIR archives all EOSDIS products and data relevant to the IV&V effort • The Toolbox provides front-end tools to access these products and data
• Provide remote site access to IV&V test information	Test Buddy	• The Test Buddy is a standalone, portable platform providing access to ISE tools and data.

Exhibit 3.2-2 ISE Objective/Component Mapping

3. PURPOSE AND DESCRIPTION OF THE ISE

3.1. Purpose and Objectives

The purpose of the EOSDIS IV&V Integrated Support Environment (ISE) is to ***provide consistent, accessible, and controlled use and availability of tools and information to the ISE user community independent of user location***. By maintaining the focus of this purpose, the ISE provides virtually all IV&V and other COTR-authorized personnel access to EOSDIS IV&V data, tools, and information to support their full range of activities. The primary objectives of the ISE are as follows:

- To provide tool support for IV&V tasks
- To provide visibility to EOSDIS IV&V products, results, and data
- To provide visibility to EOSDIS development and integration documentation
- To provide remote site access to IV&V test information

3.2. ISE Components

The ISE consists of the **Integrated Information Repository (IIR),** the **Toolbox,** and the **Test Buddy.** Together these components support the ISE user community by providing an integrated environment which automates and integrates various aspects of IV&V task processes, tools and data. Significant benefits are realized by the integration and can be attributed to one or more of the following:

- Information sharing
- Increased productivity
- Analysis repeatability
- Data integrity
- Completeness
- Consistency
- Product quality
- Product integrity

The IIR is the heart of the ISE, holding all the IV&V project data and results, as well as the EOSDIS development information. This repository is accessible to the user community via front-end tools provided by the Toolbox, the second component of the ISE. Along with the front-end tools, the Toolbox contains all of the IV&V tools necessary for the IV&V task team to perform their daily IV&V responsibilities. The output products and data generated or utilized by the tools are stored in the IIR. The third and final component, the Test Buddy, is a self-contained, portable platform with accessibility to the ISE. The Test Buddy enables IV&V testers to complete test scenarios and cases on site with the ability to access information in the IIR and to rapidly submit test results. Exhibit 3.2-1 illustrates these three components of the ISE and their relationships.

14. “EOSDIS IV&V Task 11 Key Interface Testing Statement of Work”, dated 11 October 1994.

15. “EOSDIS IV&V Task 12 EDOS IV&V Statement of Work”, dated 17 October 1994.

16. “EOSDIS IV&V Task 13 IV&V Special Studies Statement of Work”, dated 15 November 1994.

17. “Integrated Support Environment (ISE) System Architecture”, Deliverable 0405, dated 30 January 1995.

2.2. Applicable Documents

The following documents are referenced herein and are directly applicable to this volume:

1. "Earth Observing System (EOS) Performance Assurance Requirements (PAR) for the Independent Verification and Validation (IV&V) of the EOS Data and Information System (EOSDIS)", GSFC 420-05-05, dated March 23, 1993

2. "Statement of Work for the Independent Verification and Validation (IV&V) of the EOS Data and Information System and Key EOS Ground System Interfaces", dated April 19, 1993

3. "NASA Software Documentation Standard Software Engineering Program (NASA-STD-2100-91)”, dated July 29, 1991

2. RELATED DOCUMENTATION

2.1. Parent Documents

The following documents are parents to this document:

1. "Integrated Support Environment (ISE) System Requirements", CDRL 0404, dated 28 October 1994.

2. "Independent Verification and Validation Management Plan (IVVMP)", CDRL 0301, dated 2 December 1994.

3. "Independent System Verification & Validation Plan (ISVVP)", CDRL 0302, dated 15 December 1994.

4. "EOSDIS IV&V Task 1 IV&V Project Management Statement of Work", dated 11 October 1994.

5. "EOSDIS IV&V Task 2 Facilities, Operations, and Program Reporting Statement of Work", dated 17 October 1994.

6. "EOSDIS IV&V Task 3 Independent Verification and Validation Plans Statement of Work", dated 11 October 1994.

7. "EOSDIS IV&V Task 4 IV&V Infrastructure and Tool Development Task Statement of Work", dated 11 October 1994.

8. "EOSDIS IV&V Task 5 Requirements Analysis and Traceability Task Statement of Work", dated 11 October 1994.

9. "EOSDIS IV&V Task 6 ECS Interim Release 1 Development Analysis Task Statement of Work", dated 11 October 1994.

10. "EOSDIS IV&V Task 7 ECS Release A Development Analysis Task Statement of Work", dated 11 October 1994.

11. "EOSDIS IV&V Task 8 ECS Release A IV&V Test and Test Scenario Generation Statement of Work", dated 11 October 1994.

12. "EOSDIS IV&V Task 9 Key Interface Analysis Statement of Work", dated 11 October 1994.

13. "EOSDIS IV&V Task 10 Development of EOS Ground System Certification Plan Statement of Work", dated 11 October 1994.

Section 9 presents the ***risk management plan*** which identifies the potential risks affecting the development or acquisition, the methods employed to identify the risks and the measures that will be taken to mitigate the risks.

Section 10 is the ***configuration management plan*** including change control, version control and status accounting procedures.

Section 11 provides the ***delivery and operational transition plan*** which sets forth the activities associated with deployment of the system. These activities include delivery and installation planning as well as user training.

Section 12 contains the ***abbreviations and acronyms*** list for the document.

Section 13 contains the ***glossary*** for the document.

Section 14 contains ***notes*** for the document.

- NASA-DID-M500 Risk Management Plan
- NASA-DID-M600 Configuration Management Plan
- NASA-DID-M700 Delivery & Operational Transition Plan

Since the ISE will be primarily comprised of Commercial Off-The-Shelf (COTS) products and ISE development activities are limited, information specified for inclusion by referenced DIDs is included within this document. Justification for not producing an extensive development plan documentation set centers around the fact that new development will be limited in terms of size and scope based upon the limited tool development staff. As the tool development staffing assignments reflect in section 4.3.3, Organization, the development of a specific tool is generally performed by no more than two individuals. Therefore, only process documentation which yields significant benefits (e.g. CM process) will be detailed. Where information is requested by the NASA-DID-M000 which is determined to be not applicable (N/A) or overly intrusive for the ISE development effort being undertaken, it is so documented.

Section 1 establishes the context of the document through an ***introduction***. This section identifies the document, the scope, purpose, objectives and the status of the document.

Section 2 lists the ***related documentation*** including parent documents and applicable documents.

Section 3 describes the ***purpose and description of the ISE system software.*** This section provides a background for understanding the objectives for the management planning information presented in this document.

Section 4 details the ***resources, schedules and organization*** for the software acquisition and development activities. This section defines the activities, method and approach for development, schedule of activities, the organization performing those activities and the facilities allocated to the project.

Section 5 explains the ***acquisition activities plan*** for procured hardware and software. This section includes both the Commercial Off The Shelf (COTS) products as well as the Government Off The Shelf (GOTS) products which are components of the overall system.

Section 6 contains the ***development activities plan*** which describes the development process and engineering planning for each of the developed components of the system.

Section 7 delineates the ***sustaining engineering and operations activities plan*** which encompasses all of the maintenance and operations for the life cycle of the system after final delivery.

Section 8 contains the ***assurance plan*** for the developed software. An identification of the type and level of certification (analysis, inspection, demonstration, and test) of the various components.

1.2. Scope of Document

The ISE Development Plan details the development environment, personnel, methodologies, processes, and schedules associated with those development items necessary in the establishment of the ISE.

1.3. Purpose and Objectives of Document

The purpose and objectives of the ISE Development Plan is to provide the organization for all planning information in developing the ISE. It includes planning for management, assurance and development for all life cycle phases for the software, including sustaining engineering.

1.4. Document Status and Schedule

This document, dated 27 February 1995, is the first official release of the ISE Development Plan. A DRAFT of the ISE development plan was released on 30 January 1995 to solicit feedback on the documented development approach and the development item schedules. Key deliverable milestones/requirements associated with this document include:

- ISE Integrated Support Environment (ISE) Development Plan -- DRAFT
  31 January 1995
- ISE Integrated Support Environment (ISE) Development Plan -- FINAL
  28 February 1995
- ISE System Design Review -- 18 August 1995
- ISE Release 1 Demonstration (ISER1) -- 16 February 1996
- ISE Release 2 Demonstration (ISER2) -- 14 June 1996

The initial release of the ISE will be fielded in February 1996 and will evolve as additional IV&V needs are defined during the span of the EOSDIS project.

1.5. Documentation Organization

The organization of this document conforms to the Management Plan Data Item Description (DID) NASA-DID-M000 from the NASA Software Documentation Standard (NASA-STD-2100). Other DIDs which are referenced from the NASA-DID-M000 include:

- NASA-DID-999 General
- NASA-DID-M100 Acquisition Activities Plan
- NASA-DID-M200 Development Activities Plan
- NASA-DID-M300 Sustaining Engineering & Operations Activities Plan
- NASA-DID-M400 Assurance Plan

1. INTRODUCTION

1.1. Identification of Document

This is the Integrated Support Environment (ISE) Development Plan document generated under the Independent Verification and Validation (IV&V) Infrastructure and Tools task order of the Earth Observing System Data and Information System (EOSDIS) IV&V contract. EOSDIS is being developed for the National Aeronautics and Space Administration (NASA) where Intermetrics is the IV&V prime contractor.

The ISE System Architecture document, dated 30 January 1995, is the predecessor or parent of this system level development document. This ISE Development Plan document provides the framework and foundation for the ISE development activities. The ISE development activities follow a Spiral model while adhering to many of the Waterfall phases and milestones. The Software Development Lifecycle is depicted in Exhibit 1.1-1. Note that the software analysis and design phases have been lengthened to accommodate for the prototyping activities associated with Spiral model.

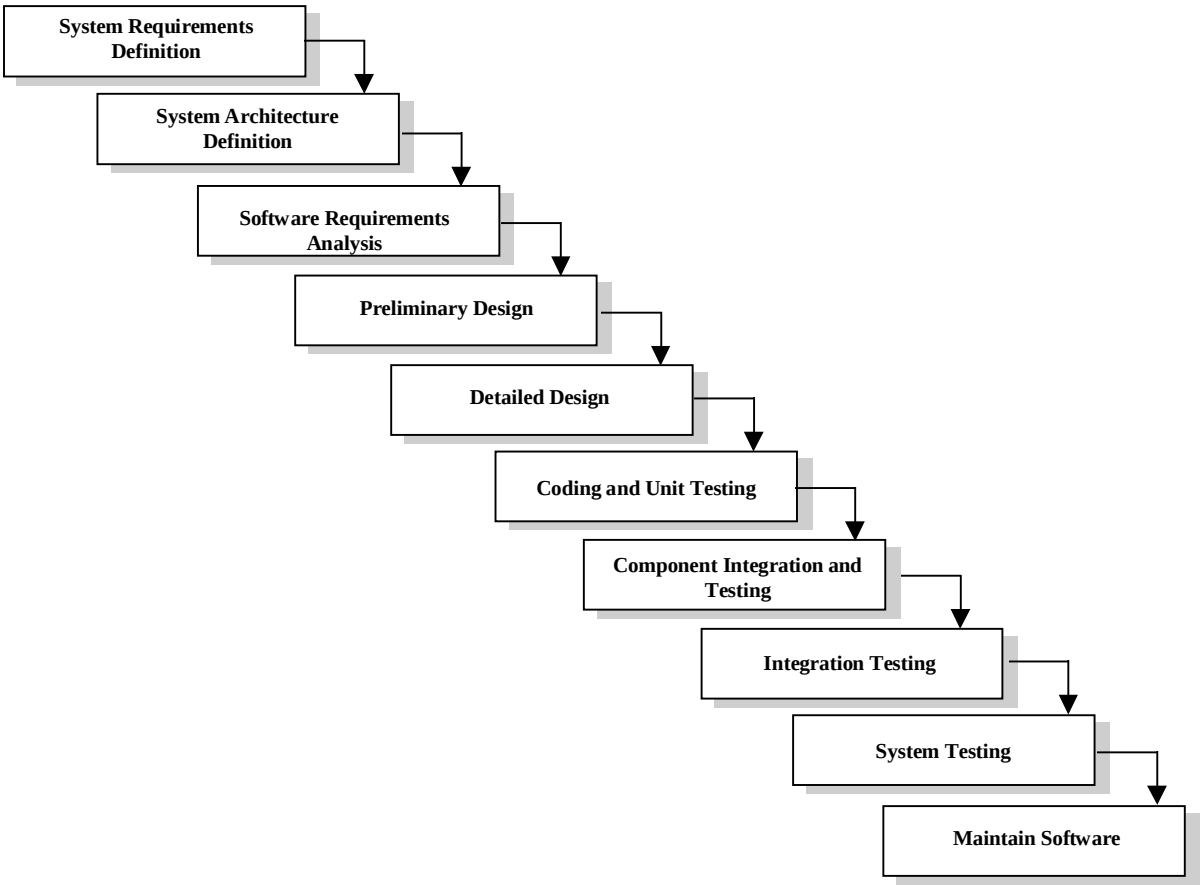

Exhibit 1.1-1 Software Development Process

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INTEGRATED SUPPORT ENVIRONMENT (ISE) DEVELOPMENT PLAN

(Deliverable 0407)

February 27, 1995

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